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VOL. I DECEMBER 1899 No. 3

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The Automobile Magazine

VOL. I DECEMBER 1899 No. 3

CONTENTS

AGENCY FOR FOREIGN SUBSCRIPTIONS:
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"Jumbo" to the Rescue

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The Automobile
MAGAZINE

VOL. I DECEMBER 1899 NO. 3

The Horseless Fire Engine

By Captain Cordier

Technical Engineer of the Paris Sapeurs-Pompiers Regiment

NOW that the automobile is coming into such general vogue that all the traffic of our cities bids fair to be revolutionized thereby, we must look for a corresponding reform of our great municipal fire departments. Steps in this direction have already been taken in Paris, where every fire brigade is to be equipped with horseless engines and apparatus,—in Buda-Pest, where self-propelled fire engines have become a familiar sight, and in New York, where the Chief of the Fire Department can daily be seen darting to points of danger in a specially constructed automobile of his own, with which he can distance all other vehicles on the way. In New York, as well as in other American cities, such as Boston, Hartford, Pittsburg and Buffalo, powerful steam fire engines which can be run without the assistance of horses have indeed been in use so long that they are no longer considered in the light of experiments.

This is but as it should be, since fire engines run and operated by steam must in truth be regarded as the first practical forerunners of the modern automobile. Long before automobile pleasure carriages were heard of powerful steam-traction engines were employed to fight fires, and some of them were brought to such a point of perfection that even from our present *fin-de-siècle* point of view they leave but little to be desired.

Thus a daring American engineer, Captain John Ericsson, of Monitor fame, as early as 1840 constructed a steam-propelled fire engine which proved a complete success. Twenty years

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later the more distant suburbs of the City of Boston were reached by means of a steam fire engine steered with a pole—the invention of a local fire chief, Frank Curtis. In later years the famous American Amoskeag Engine Company built self-propelled fire engines, which were used in New York for some time, until they were abandoned by reason of the heavy snows which rendered them impracticable in winter. In summer, it was claimed, they ran so fast that they were declared to be dangerous to traffic.

At the present time the City of Hartford, Connecticut, is in the proud possession of the largest and most powerful locomotive

Boston Fire Engine Responding to Call
Copyrighted by G. B. Brayton

steam fire engine in the world, named "Jumbo" (*see frontispiece*). Over 10 feet high and 17 feet long, it weighs 8½ tons, and can throw 1,350 gallons of water per minute. The boiler contains 301 copper tubes. This engine, at her first trial threw, through 50 feet of hose, 3½ inches in diameter, a horizontal stream of water a distance of 348 feet, and threw two streams, each as large as that thrown by an ordinary fire engine, a distance of over 300 feet. The road driving power of the engine is applied through two endless chains running over sprocket wheels on each of the main rear wheels, permitting these wheels to be driven at

varying speeds when turning corners. The engine may be run either forward or backward, and can be stopped inside of 50 feet when running at full speed. When in the house the boiler is connected with steam pipes from a heater in the basement, and steam is always kept up to about 95 pounds, which would run her about a quarter of a mile. The fire box is kept full of material ready for lighting, and a steel arm under the engine carries a quantity of waste saturated with kerosene oil in close proximity to a card of matches in a holder under a scratcher, the latter being attached to a cord tied to a ring in the floor. At an alarm of fire

Horseless Engine at its Station
Copyrighted by G. B. Brayton

the steam pipes are disconnected, the throttle opened, and, before the engine has moved six inches, the cord pulls the scratcher and the rod carrying the blazing waste swings around under the fire box, igniting the shavings and wood. Cannel coal is burned and steam enough can be generated in two minutes to run the engine at a speed of thirty-one miles an hour.

The horseless fire engines now operated in Boston are likewise of the Amoskeag type. From the ground to the top one of these engines is 10 feet; its length over all is 16 feet 6 inches, and the width over all is 7 feet 3 inches. The weight, equipped

for service, is 17,000 pounds. The boiler is upright and tubular in style, with a submerged smoke box, and is expanded at the lower end to increase the grate surface. It is made of the best quality of steel plate, with seamless copper tubes, and is thoroughly riveted and stayed. It is jacketed with asbestos and has a lagging of wood which supports the metallic jacket. The connections with the steam cylinders are simple and have the advantage of being entirely unexposed to the air. The steam cylinders are cast in one piece. They are firmly secured to the boiler and framing and are covered with a lagging of wood, with a metallic jacket on the outside. The main shell of the pump is in one solid casting. It is a double acting and vertical pump and its valves are vertical in their action. The pump is arranged for receiving suction hose on either side and has outlets on either side for receiving the leading hose. The connection between the steam cylinders and water cylinders or pumps may be made by the old and familiar link motion and link block, or the equally familiar cross-head and connecting rod plan, both giving excellent results for ordinary steam fire engines. In the self-propelling engine, where the engine power is transmitted to the driving wheel through the main crank shaft, which is not the case when this power is transmitted to the pumps, the cross-head and connecting rod plan has many advantages, and is therefore adopted for self-propelling engines.

The manner of handling the self-propellers is very simple. The chief engineer rides on the fire box of the engine and has directly under his hand the various levers and wheels which start, stop and regulate the speed of the machine. The assistant engineer rides on the driver's seat, and by means of the large steering wheel he steers the machine in exactly the same manner as the rear wheels of the long ladder trucks are governed through a system of bevel and worm gearing. The engine can be turned around in an ordinary street with ease.

The road driving power is applied from one end of the main crank shaft to an equalizing compound, and two endless chains running over sprocket wheels on each of the main rear wheels permit these rear wheels to be driven at varying speeds when turning corners. The driving power is made reversible, so that the engine may be driven forward or back at the will of the operator. When it is not necessary to use the power of the engine for driving purposes, the driving mechanism can be disconnected by the removal of a key, so that the pumps may be worked with the engine standing still. An extra water tank is carried at the rear of these engines to supply the boiler until connections

can be made with a hydrant. The self-propeller can travel on a fair level road at a maximum rate of twelve miles an hour. It can climb any ordinary grade; in fact, any one that a team of horses can climb with a heavy load.

It appears strange, in view of the great progress of electricity in America, that so little in that line has been attempted in connection with fire engines. Only very lately, it is reported, the Fire Department of New York has entered negotiations with the La France Fire Engine Company for a complete fire engine searchlight plant, consisting of a standard New York fire engine, which, in place of the pumping machinery, will be equipped with a multipolar dynamo direct connected to a high speed Forbes engine. On a platform just behind the driver there will be mounted two 18-inch Rushmore marine projectors. Each projector will be fitted with a special diverging lens with which the beam of light may be spread out to cover as wide an area as desired, so it will be equally effective at long or short range. The projectors may be quickly removed from the engine and set upon the ground at any distance from the engine to which it is connected by a flexible cable carried upon a reel under the driver's seat.

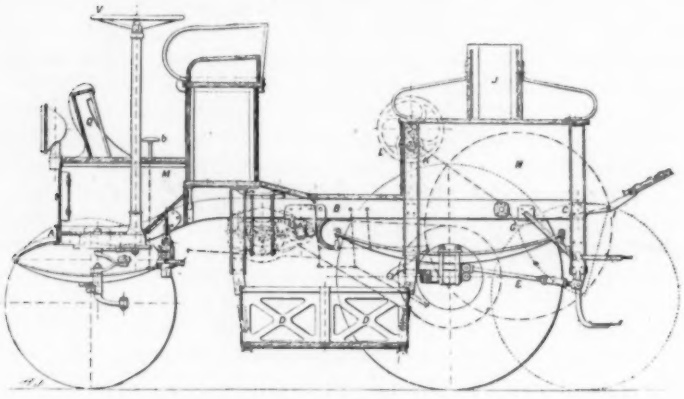
This engine will answer alarms with the other apparatus and by instantly lighting up the scene of a fire will greatly reduce the delay and dangers of fighting fires in the congested business district.

The City of Paris, in this respect, is more advanced even than the cities of the New World. Already many self-propelled fire engines, hose wagons and hook-and-ladder trucks of various types of construction have been put in operation, and others are added as soon as available, until every important fire station shall have this modern equipment.

The first of these machines to receive its baptism of fire was Porteu's automobile fire engine, constructed by M. Cambier, of Lille.

The frame of this machine is of U-shaped bar iron and supports both the motor and the pump. The gasoline motor is placed in the rear and consists of four explosion cylinders, *C* (Figs. 1 and 2), in pairs, placed symmetrically with respect to the longitudinal axis of the vehicle. It is of 22 horse-power. The ignition is electric, and the carbureting is effected by the Longuemare apparatus.

The rods of the four pistons are assembled in two pairs upon two cranks and communicate motion to the shaft, *A*, which is provided with flywheels, *V V*, at its extremities. This shaft,



Section of French Gasoline Fire Engine

through a train of gear wheels, transmits motion to an intermediate transverse shaft, *A'*, which might be called the distributer of motion, since it actuates either the propelling apparatus or the pump, as may be desired. It communicates motion to the vehicle through the intermedium of drums, *M N O*, the different diameters of which furnish two running speeds that correspond to about nine and five miles an hour. These drums actuate a series of fixed pulleys, *b d*, and idle pulleys, *b'd'*, keyed upon the shaft that carries the chain sprockets, *p p*.

Transmission from the drums to the pulleys is effected by cross belts, the shifting of which from the fast to the idle pulleys is produced through the action of the rods, *h h*, which are maneuvered from the front of the vehicle by a lever, *L*, mounted upon the same axis as the steering wheel, *V'*.

The intermediate pulleys, *N* and *e*, belong to the mechanism that produces a backward motion, and are connected by a belt, upon which acts a stretcher, *T*, maneuvered through a handwheel, *V''*, placed under the front seat. All the belts are surrounded by an iron plate jacket that protects them from the action of the water coming from the pump.

The pump is actuated by the shaft, *A'*, which communicates motion to the driving wheel, *M*, through a pinion keyed upon the shaft.

The throwing of the drums into gear and of the pump out of gear is effected instantaneously and automatically. A fire may thus be attacked as soon as the engine arrives upon the spot, with-

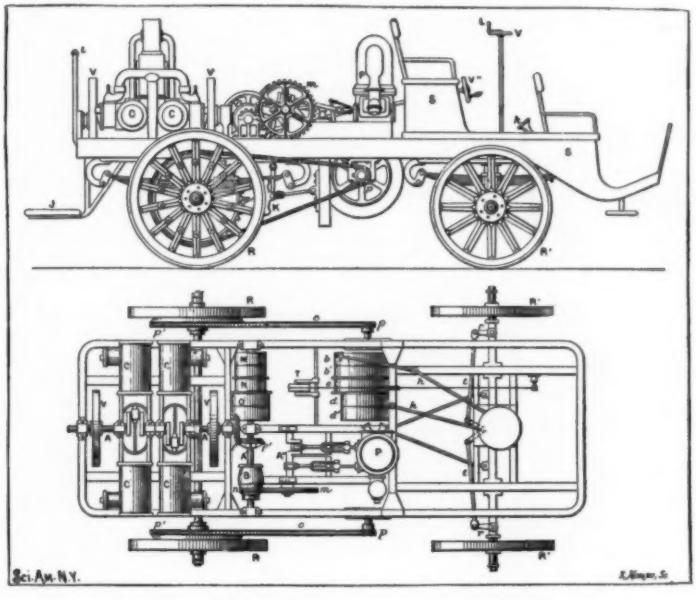
out its being necessary to modify the running of the motor in any way whatever.

The pump, which is of the Thirion system, is capable of throwing 3,000 gallons of water a minute. Power is transmitted to it wholly by gearings, so that the inconveniences that would result from the use of belts, through the stretching of the leather under the action of the water coming from the pump, are done away with.

The steering of the engine while running is done by means of the handwheel, *V'*, which acts upon the pivots of the front wheels, *R' R'*, through the intermedium of rods, *t*, and levers, *r*. Finally, the vehicle is provided with a brake, *K*, which is actuated by a pedal, *B*, placed under the foot of the driver.

As such an apparatus must carry a number of firemen with it, the fore-carriage is provided with two seats, *s* and *s'*, each capable of accommodating three persons, and with a platform, *J*, in the rear, upon which several men can stand.

This new engine has been submitted to numerous experiments in the presence of the Chief of the Paris Fire Department and his staff, and to many other persons competent to judge in such



Section and Plan of Porteu's Automobile Fire Engine

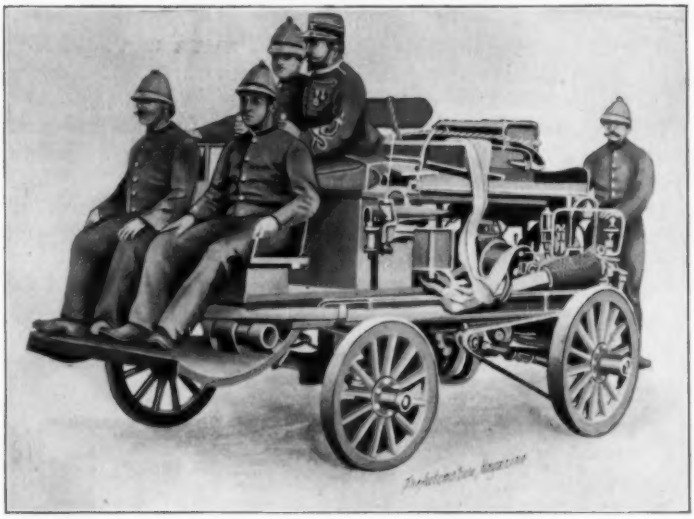
matters, and has been found to operate in the most satisfactory manner.

Paris firemen have also lately been out making successful experiments with the automotor constructed especially for the service of the pompiers, after the plans of Colonel Krebs. The vehicle, which is painted red, was filled with hose and general material, and, with six men on board, went for several miles along the quay in the direction of Notre Dame Cathedral. It accomplished the journey backward and forward in a very expeditious manner and without a hitch. The motor may be seen in the fire brigade station near the Law Courts on the Boulevard du Palais. The officers of the establishment in question believe that the new cars which are in course of construction will enable firemen to answer calls in half the time required by horses.

Before this an electric hose carriage was already in use by the Paris Fire Department. The machine weighs over a ton, or with equipment, nearly three tons. The equipment consists of six men, apparatus to operate three lines of hose, a scaling ladder,

French Electric Fire Department Wagon

The Horseless Fire Engine



French Gasoline Fire Engine En Route

apparatus for wire in cellars, and one for life-saving purposes. It can travel fifteen miles an hour on good roads.

To be more exact, it should be stated that this car is of a gross weight of 1,800 kilogrammes, and of a total weight of 2,550 kilogs. (including six men), the material necessary for operating 3 hoses, 24 metres of piping, a ladder, cellar fire appliances and rescuing apparatus.

It can proceed 60 kilometres at a speed of 15 kilometres per hour, without being recharged and with an expenditure of 40 to 45 amères. On a good road it proceeds 22 kilometres with an outlay of 55 ampères. The start is well performed—instantaneous.

The motor is of 4,000 volts; the battery of accumulators weighs 520 kilogs., and has a serviceable capacity of 180 ampères.

The body of the car measures 3.25 metres in length and 1.95 metres in width.

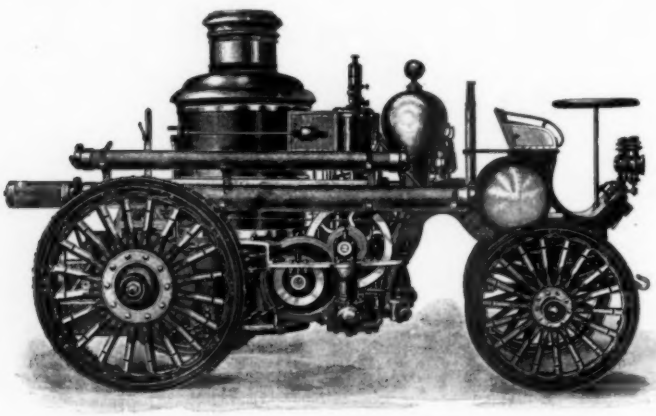
The body and all the motor parts are raised upon a steel frame in *U* bent. The front rests upon a short axle by a triplicate spring support. The rear is supported upon an ordinary axle by a simple spring support. The traction of the motor is brought

to bear upon the frame by the connecting rod, which also serves as coupler.

The conductor takes his place upon the carriage box, having on his right the speed-handle (4 turns forward 2 to the rear) and in front of him the direction-handle.

In front are placed the measuring appartus: the voltimetre, ampèremetre, circuit stop and a bracket for 2 arc lamps for illumination on dark nights.

In the body of the car there is a winder, an independent machine. Between the two axles, at the lower part is suspended by springs the cylinder of accumulators.



Hartford Horseless Fire Engine

This car is the first in which electricity has been applied in the traction of fire engines.

While French and American cities are instituting these reforms in their fire services little or nothing has been done so far in Germany or England. The state of public opinion on this subject in England may be judged from the following extract taken from a British journal:

"A very interesting review of the London County Council Fire Brigade was held at Peckham, when 149 officers and men, with five obsolete horse-drawn steam fire engines, four obsolete horse-drawn escapes, and four obsolete horse-drawn vans, all under Commander Wells, R. N., were "inspected," with evident

satisfaction, by the Fire Brigade Committee and their friends. The usual stock manœuvres were gone through, and a "display," more theatrical and meretricious than practical, was given of the means employed for rescuing persons.

From a technical point of view the show was disappointing; the appliances exhibited were for the most part obsolete, or, at any rate, not in accordance with the latest ideas of scientific fire prevention. Not a single mechanically-propelled fire vehicle was present, for the very simple reason that the Fire Brigade does not possess one. The reason that the Fire Brigade Committee of the County Council does not adopt automobile fire-engines is that that body lacks the necessary technical advice and knowledge of modern fire prevention and extinction."

Hartford Automobile Fire Truck

THE PROBLEM OF WHEEL-BASE

Length of wheel-base—*i. e.*, the distance between the centres of the front and back wheels—is an automobile problem worthy of study. A long wheel-base gives ease in steering. A short wheel-base causes great difficulty to the driver, and is dangerous.

The width between the front wheels should be the same as the width between the back wheels. A double track is a great fault.

The size of wheels is also important. Front wheels should be large, not small, so as to ride easily over irregularities in the road surface.

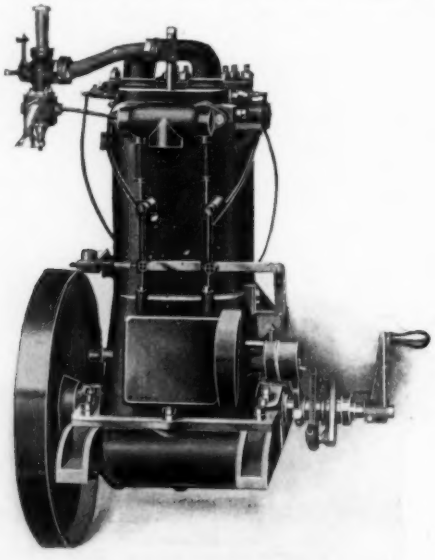
If the wheels of a carriage do not fit the wheel-ruts of country roads, driving is very difficult and unpleasant.

The Napier Motor

THE Napier motor is of the two-cylinder, vertical type, with electric ignition. The admission and exhaust valves are so arranged as to be readily accessible for cleaning purposes; they are easily removed merely by unscrewing two nuts and taking out a bolt.

The cylinders are cooled by a water-jacket supplied by a small centrifugal pump.

In starting the motor, which operation is performed by means of a hand-crank placed at one side, a special mechanism is employed in order to open the compression-valve. The moving parts are all well lubricated, and the cranks turn in oil.



The motor is provided with a ball-governor which automatically closes the admission-valve of one of the cylinders when the speed becomes excessive.

In some motors of this type Longuemare burners have been substituted for the electric ignition devices, since they are preferred by many *chauffeurs*.

The motor normally makes 780 revolutions per minute, at which speed 7-horse-powers are developed. The number of revolutions can be increased or diminished by regulating the ignition.

Santa Claus Gets a New Plaything

By Sylvester Baxter

DEAR Old Santa Claus this year will keep in touch with the spirit of the times, and on the eve of the last Christmas but one in this memorable century will make the greater portion of his rounds by automobile, in place of his famous team of reindeer drawing a sleigh. So, young friends, keep your ears wide open for the signal either of a gong's clattering staccato or the sounding of a pneumatic horn from his motor-carriage, as well as for the musical jingling of his sleighbells!

The genial old Saint has been giving a deal of thought to this matter, and has concluded that he can expedite things very materially by making use of the new system of locomotion. He has found his reindeer altogether too slow for his rapidly increasing business. They get tired too soon and he has had to have an enormous number of relays in order to make his rounds in time. All this proved expensive and inconvenient, particularly now that the dealers in reindeer-moss have caught on to the financial racket and organized a trust to put up the price on him, while lots of time has been wasted in hitching up fresh animals.

Of course he could not use reindeer everywhere, since the celebration of Christmas after his fashion has spread so extensively through the world and included so many snowless regions. So he has had to get used to horses and carriages for those parts of the world, and these have made him a deal of trouble in various ways, since somehow the reindeer was the only animal he could

get used to handling without difficulty. One thing that has long caused him much vexation is that when he has planned very carefully to use reindeer in the locations where he had the most work to do, there would either come a thaw and melt all the snow, or the expected snow would not fall at all, and the ground would remain bare and frozen. Then at the greatest inconvenience he would have to change his plans at the last moment, give up his reindeer and leave them idly eating their heads off on expensive moss imported at exorbitant freight charges, and arrange for horses. He wanted to use the automobile this year altogether, he was so much pleased with it, but since the automobile sleigh has not yet been perfected he has decided to stick to the reindeer for those parts where the drifts are too deep for wheeled vehicles and make his rounds by automobile everywhere else,

even where there is considerable snow. For he has found that the broad pneumatic tires of the latter enable it to get through pretty heavy snow.

Saint Nicholas authorizes the statement that he has organized his work for this Christmas very thoroughly, and expects to get through it with unprecedented ease and celerity. He has taken a course of lessons at the All-Saints Automobile Driving School, and has become a thorough expert. He has converted many of his brother Saints to an enthusiastic devotion to the new form of locomotion, though for a long time he could not induce Saint Anthony the Abbot, the special friend of animals, to trust himself to a spin with him.

"The horse is good enough for me," said Saint Anthony, "and I will not go back on him."

But when Saint Nicholas demonstrated to him how much happier the horse's lot was becoming by reason of the lightening of his labors through the new forms of mechanical traction, the kindly Abbot saw a new light and allowed that the inventors, manufacturers and users of the automobile were men after his own heart, and he blessed their work as that of true friends of the horse.

Saint Anthony had some time before consented to be the special patron of good roads, because of their invaluable service in making easier the work of horses and all other draught animals, and he was particularly pleased when he learned that it was a Pope who originated the good-roads movement in the Great Empire of the West. So when Saint Nicholas told him that the same Pope had gone in with equal enthusiasm for carrying the automobile into universal use, after already having emancipated millions of horses from hard work by inducing men and women to carry themselves about on a curious machine called a bicycle—doing all the work themselves by pushing the wheels around with their own feet—Saint Anthony said: "That settles it! If a Pope takes such things into his own hands there is good reason why an Abbot should not be backward in the good work."

Therefore it came about that though Saint Anthony the Abbot was the last of the halo-wearers to attend the Automobile School, his belated enthusiasm made up for his tardiness, and he was much disappointed when he learned that the manufacturers were so far behind with their orders that there would be a long delay in filling his, it had come in so late. Saint Nicholas, however, promised to do what he could for him after the Christmas rush was over. Whereupon Saint Anthony the Abbot offered to take the automobile under his special protection, stretching a point or two and regarding it as an animal, although it was a machine. So he took out the catalogue of his pet animals and turned over the leaves to find a place to write it down.

"I will substitute it for one of the extinct species," he said. "Ah! here is just the place for it, the place filled by the Great Auk; 'Auk, the Great' is the way it was listed. The poor old Great Auk! That was a good bird. He used to come a long ways to listen to my sermons and always seemed so interested! It is the way of all flesh. But may it be a long time before the horse becomes extinct."

"That brings the Automobile well to the front on the list," remarked Saint Nicholas, looking over his friend's shoulder as the latter wrote the name down.

"Yes; I keep my system strictly alphabetical," said Saint

Anthony the Abbot. "It brings the Automobile just after the Ass."

"But where is the Austrich?" queried Saint Nicholas. "I should think that ought to stand just before."

"You will find the Ostrich among the O's," was the reply. "I fear your spelling is getting a little rusty, Brother Nicholas."

"I must have caught it from so much children's spelling on Christmas bundles. Besides, I never was very strong in English orthography." And the jovial Saint laughed good-naturedly.

It was on the practice-grounds of the school that this occurred. Just then Saint Patrick came along with an automobile built specially for him on the lines of an Irish jaunting-car. "Well, Tony, me boy," he cried, as he drew up, "so we've got you here at last. But what are you doing here with that beast-book of yours?"

They told him, and Saint Patrick agreed that it was a most admirable thing to do. "If 't isn't an animal it ought to be," he said; "it knows so much; but while you are revising your list

of craytures you had better strike the snakes out of it; just call your book Ireland and I'll drive 'em out meself."

Saint Anthony the Abbot explained that no noxious animals were on the list of his friends; he had included only the harmless snakes, like the garden ones—such as the striped kind, for instance—that were friendly to man and ate up vermin that preyed on his crops.

"But a snake's a snake," replied Saint Patrick, "except when he's in a man's boots, and then he's the jimjams. I'll have none of 'em on my visiting list."

Now and then a member of the Saintly hierarchy would come

speeding along on his automobile, hugely enjoying the sport. It was interesting to note the preferences of various individuals as to make and type of machine. "Here comes Brother Elijah, making a Holy terror of himself, with his bald head and long white beard, streaking it along on a clumsy, old-fashioned thing that coughs fire with every exhaust, and making a noise like a tugboat," said Saint Patrick. "He was stuck on the thing at first sight and would have no other. He said it reminded him of the Chariot of Flame that brought him up here, and he enjoyed every minute of it. But by the looks and the sound of it the blazing old rattlety-bang seems more befitting the Boss of the place down below—especially when old Baldy goes tearing along the country roads at dusk trailing fire like a comet.

"And there's Brother John the Baptist! He swears by steam just because the machine carries a water-tank!"

To return to the Christmas plans of old Santa Claus. As we have learned, he has organized his work on an automobile basis very thoroughly. He will use relays of automobiles just as he has had to with reindeer and horses. In this case, however, it is a matter of choice and not of necessity. He could easily fix it to make all his rounds on one automobile, the only cause of delay being the replenishment of motive-power material, and that could easily be arranged for without difficulty, except in the case of electricity. But there are so many good makes that he did not want to show any partiality, and so he concluded to give each approved make its turn. Moreover, he did not want to forego the pleasure of trying the various styles of electric carriage, all of which had been placed at his disposal by the Electric Vehicle Company and other makers.

Another consideration that determined him in favor of the relay plan was the fact that a great many automobiles were to be given as Christmas presents. So all he has to do is to dash up to the door on the motor-carriage in question, leave it there to be run into the stable and jump into another one that stands ready for him, to be left for somebody a little farther on. His work will be enormously accelerated by his ability to travel light, for the vehicles he goes in himself will never be freighted. But he will be followed by a marvellously long train of automobile delivery-wagons, motor-trucks, etc.—many of them lent for the occasion by the greatest department stores, the German and French postal authorities, etc., and all heavily laden with gifts, and coming in such order as to preclude all confusion in their distribution.

There was one thing about the automobile service, as he

arranged it, that gave particular satisfaction to the good Saint. He had always had to bundle up a great deal about his feet to keep them warm in the biting cold weather that prevailed through so large a part of his circuit, and this made it very clumsy and awkward for him with all the climbing around he had to do, getting down chimneys, etc., to reach the rooms where the children slept. And he also lost a deal of time in changing to the pajamas that constituted his costume for Australia, New Zealand, South Africa and other parts of the Southern Hemisphere, where Christmas comes in the summer—as well as in the tropics, where he was wont to conform to the customs of low latitudes and luxuriate in bathing trunks only.

Now, with all the automobiles, where heat was used to produce the motive-power, he had the exhaust steam or the hot products of combustion carried through coils at his feet. And for the electric vehicles he had a little electric foot-warmer attached. Under ordinary circumstances this comfort would hardly be practicable in the case of electricity, for the consumption of the power for heating would shorten the radius of the storage battery altogether too much. But since the relays were to be so frequent it made no difference in his case. Consequently one of the greatest hardships of his task was overcome and he looked forward to having not only his feet as warm as toast, but his whole body as well. Therefore, since this year he would not have to wear his weight in heavy clothing to keep out the cold, he is going to get about with unprecedented agility, and, with all the facility of a weasel, get through numerous crevices that he never ventured to tackle before. All this pleases him so that he promises to leave automobiles in as many stockings as he can—not only metaphorically, in the case of big hose for grown-up people, but literally, in the shape of a lot of beautiful automobile toys for children.

Our First Club Run

By Edgar S. Hyatt

LAST month New York had a foretaste of the century to come. For the first time since the early Dutch settlers of New Amsterdam astonished the natives with their wheeled carts and wagons, the people of Manhattan beheld some of their prominent fellow-citizens gliding through the town in a noiseless procession of swift self-propelled vehicles. It was the first public run of the new Automobile Club of America, and proved as brave a sight as New York has witnessed in many a day.

Coming as it did immediately after a futile attempt to bar horseless pleasure vehicles from the parks of New York, this demonstration of the club was a complete success. With the exception of one punctured tire there was no accident to mar the day, nor did a single horse kick over the traces when this parade of all conceivable makes and patterns wound its way in and out of the mazes of Fifth avenue and the Riverside Drive. What is more, it was a demonstration that was appreciated, for, thanks to the perfect weather of early November, thousands of people thronged the entire route of the parade, amongst whom any runaway would have been bound to create serious havoc.

The greatest crowd assembled at the Waldorf-Astoria Hotel, the present headquarters of the club, and by the time the start was to be made more than a thousand curious people were massed in

President Andrews and Jefferson Seligman in the Lead

front of the carriage entrance. From north, east, west and south the autos came squeezing through the throng and came to a halt near the hotel, while the club members partook of luncheon within.

All styles of machines and vehicles put in an appearance. There were victorias and phaetons, hansoms, wagonettes and runabouts. Every type of carriage seen in the Park daily was there, but only the horses were lacking. Uniformed and liveried grooms were perched behind, and fair women, in gowns of latest automobile cut, sat beside the drivers, who, like gentlemen whips, were perched on the boxes of their own rigs.

Luncheon over, the automobilists emerged from the hotel and the bicycle policemen serving as outriders strove to clear a way. There was much confusion at the start, owing to the jam in front of the hotel, and the automobilists aroused the admiration of the crowds on the sidewalks by their clever manœuvres in and out between the mettlesome horses of many private carriages and hansoms waiting at the hotel entrance until Fifth avenue was reached.

Our First Club Run

In the first carriage, which was an electric victoria, was Avery D. Andrews, President of the club and Adjutant General of the State. He was accompanied by Jefferson Seligman, who handled the levers. In the second vehicle, a gasoline road wagon, were George F. Chamberlin, Vice-President of the club, and S. H. Valentine. Third place in the line was given to Whitney Lyon, founder of the club. He had his electric dos-a-dos trap, and was accompanied by Mrs. Lyon, General George Moore Smith and Miss Smith. In the next carriage, a locomobile, was Amzi L. Barber, with S. T. Davis, Jr.

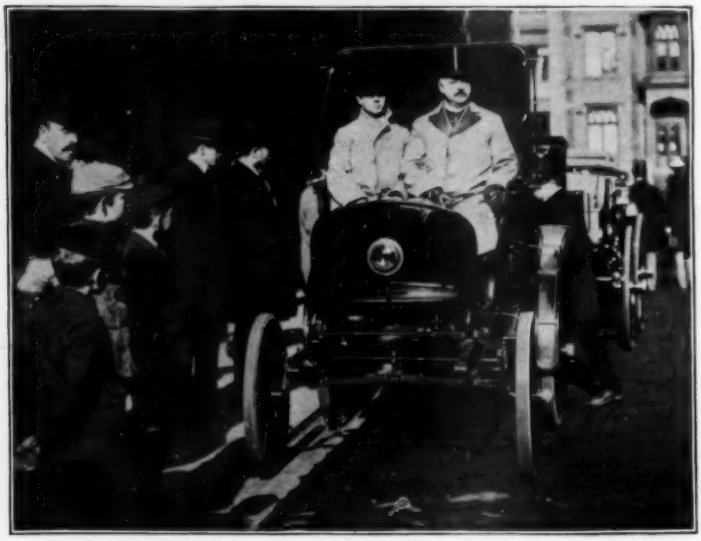
Albert C. Bostwick, who had the next place in line, had started from his stable in an electric victoria, but having met with a mishap, went back for a locomobile runabout, in which he attracted much attention in the parade. Next to Mr. Bostwick was Winslow E. Buzby, who is regarded by his fellow club members as a martyr for having submitted to arrest in order to obtain the admission of automobiles to Central Park. Mr. Buzby had an electric phaeton and was accompanied by Mrs. Buzby. Mr. J. Post, Jr., followed, and Mr. Le D. L. Barber, with the Secretary

Messrs. Whitney Lyon and Winslow E. Buzby

of the Club, in a steam motor, came next. A. L. Riker, in an electric trap, and having W. G. McAdoo and K. B. Conger as his guests, followed.

Edward H. Lyon, in his steam automobile, was next, and he was followed by an electric surrey guided by Frank Pusey, who had as his guests General G. M. Dodge, J. Horace Harding, W. L. Brown and George B. Hopkins. J. A. Blair had an electric brake on which were Mr. and Mrs. Edwin Curtis and Miss Blair. Dr. John D. Zabriskie was next, in a gasoline carriage. Next was A. O. Krieger, with a De Dion motor. F. A. La Roche, in a gasoline road wagon, had W. J. Sergment as his guest. W. H. Hall also had a gasoline motor. George Isham Scott followed on a De Dion tricycle. John H. Hallock had as his guests in an electric surrey Mrs. John Wood, Mrs. C. J. McDermott, Mrs. Johnson and J. H. Wood. Thomas H. Thomas, in a locomobile, with W. H. Thomas as his guest, followed. Mr. J. C. McCoy, in his gasoline victoria, had E. B. Bronson as his guest. A. L. Whiting, in an electric, and William E. Burroughs and A. E. Bardwell, in the same type of carriage, followed.

Alexander Fischer and Mrs. Otto, in an electric vehicle, followed by Curtis P. Brady and E. B. Brady, in an electric run-



Marshall P. Wilder and Col. J. Marceau

The Parade Passing the Waldorf-Astoria

about, were next. Alan R. Hawley had as guests Miss Hawley and William Hawley. Colonel Theo. C. Marceau, in his fine electric carriage, was accompanied by Marshall P. Wilder. C. J. Field, in his gasoline carriage, had W. B. Atkins as his guest. Dr. E. C. Chamberlain was in his electric carriage, with Miss Louise Faulkner as his guest.

Others in the parade were Clarence W. Wood, accompanied by L. T. Gibbs; A. E. Chandler, Eleazer Kempshall and Mrs. Kempshall, in their electric hansom, Alphonso Pelham and Mrs. Pelham, Albert R. Shattuck, Charles T. Yerkes, G. L. Richard, F. M. Krugler, and the editor of this magazine.

The start of the parade was watched with interest by Admiral Dewey's bride-elect, who stood for some minutes at a window in her apartment in the Cambridge Hotel. When the procession of automobiles had fairly started on its way, many of the onlookers followed its route in carriages or on bicycles, just to see how it progressed.

The first objective point was the new Naval Arch glistening white at the intersection of Fifth avenue and Broadway. Without entering the Court of Honor the parade here turned northward. Going up Fifth avenue the automobiles received applause from

the spectators who fringed the sidewalks. Each carriage rolled along its way at an easy pace of four miles an hour. Owing to the crowded condition of the thoroughfare it was found to be impossible, however, to preserve the order of march.

Above Fifty-ninth street General Andrews increased the speed of his carriage, as there was an abundance of room and smooth asphalt for blocks. Then the run took on life and animation. Members left the line and spurted ahead to get a look at the other carriages, and at times the parade would be in a bunch instead of a single line.

Having passed all the forbidden entrances of Central Park and Mount Morris Park the column wheeled to the left around the Park and followed Fifth avenue to One Hundred and Twenty-sixth street, where it turned west to Lenox avenue, the popular drive leading to the Harlem Speedway.

There was soft mud here, which retarded the speed of some of the carriages, so that quite a gap was opened up when the half dozen leading vehicles turned west and presently swung into the Riverside Drive. Moving up the Drive the automobiles closed

Messrs. Curtis and Blair with their Ladies

Our First Club Run

Gen. Andrews Reviewing

up and on passing Grant's Tomb they were cheered by several hundred persons.

At the Claremont Hotel, at the head of the Drive, there was a halt of an hour for refreshments. Members of the club gathered in groups and congratulated each other on the success of the first run under the auspices of the new organization.

General Andrews reviewed the parade from his carriage opposite Grant's Tomb at the beginning of the return run, late in the afternoon. Excellent time was made down Riverside Drive. Some who were chafing at the retarded pace increased their speed, and in groups of three or four abreast the motors dashed down the Drive. The bicycle policemen found themselves unable to follow and could not have coped with the racers had these not slowed up of their own accord after their little brush.

After the return to the Waldorf-Astoria the success of this first run was celebrated by a series of informal dinner parties among the club members. Before the paraders returned home the leading spirits among them had already arranged for another more ambitious run, this time to Ardsley, forty miles up the Hudson River.

The Oakman Automobile

THE Oakman Automobile, illustrated herewith, is a vehicle of novel construction, a gasoline phaeton, weighing about 500 pounds. The front or steering wheels are similar in type and attachment to the bicycle. The motor is placed under the rear of the body; it consists of a pair of cylinders, cast in one piece, the connecting rods taking the same crank wrist.

The interior mechanism is made accessible for examination by the entire hinged metal back of the carriage being raised. Directly under the cylinders is the muffler for the exhaust, having

a small elbow turned downward at one end. It deadens the sound of the exhaust most effectively. To the right of the cylinder is the small dynamo for sparking, the armature of which is rotated by frictional contact with the main shaft fly wheel; located on the extreme left is the spark coil, and under the seat is a storage battery. The current for sparking is taken from the storage battery, the latter being kept charged by the dynamo when the carriage is in motion. Above the engine cylinders and under the seat are two tanks separated by a small space; the left is for the

storage of gasoline, the right for water. The rear axle is of peculiar construction, in the shape of the letter U; the single springs that support the body at the rear are suspended from stirrups depending from the wheel axles. The driving wheels have an interior annular driving rim, against which the grooved driving pulleys of the main driving shaft impinge and impart the power of the engine to the wheels by friction. This shaft is manipulated forward or backward by the single lever rising upward in the centre of the carriage and is one of the features which make the vehicle distinctive. By means of a latch lever attached to the driving lever the operator starts the engine from his seat by engaging the latch lever in a ratchet wheel under the seat attached or geared with the main shaft, so arranged that when the driving lever is drawn suddenly back it will cause the ratchet wheel to rotate the engine enough to allow the sparking, and thus cause the needed explosions. After it is started the latch lever is released and the driving lever pushed forward, which brings the driving grooved pulleys into contact with the driving wheel rims. The speed may be regulated by this frictional contact or by rotating the top of the handle of the driving lever with the hand, which admits or cuts off the air supply to the engine. A backward motion of the driving lever applies the brake.

New Fifth Avenue Electric Stage

The Coaches' Overthrow;

Or, A Jovial Exaltation of Divers Tradesmen, and Others, for the Suppression of Troublesome Hackney Coaches

An Elizabethan Ballad

As I passed bye, this other day,
  Where sack and claret spring,
I heard a mad crewe by the way,
  That loud did laugh and sing:
Heigh downe, dery, dery downe,
With hackney-coaches downe!

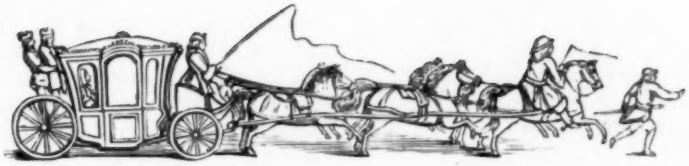
The very slugs did pipe for joy,
  That coachmen hence should hye;
And that the coaches must away—
  A mellowing up to lye:
Heigh downe, dery, dery downe,
With hackney-coaches downe!

The world no more shall run on wheeles,
  With horses, as't has done;
But they must take them to their heeles,
  And try how they can run:
Heigh downe, dery, dery downe,
With hackney-coaches downe!

The elder brother shall take place—
  The youngest brother rise;
The middle brother's out of grace—
  And every tradesman cryes:
'Twould save much hurt, spare dust and dirt,'
Were they clean out of towne!

Coach-makers may use many trades,
  And yet enough of meanes;
And coachmen may turne off their jades
  And helpe to drain the fens:
Heigh downe, dery, dery downe,
With hackney-coaches downe!

'Tis an undoing unto none,
  That a profession use;
'Tis good for all—not hurt to one—
  Considering the abuse:
Then heigh downe, dery, dery downe,
With hackney-coaches downe!



The World on Wheels

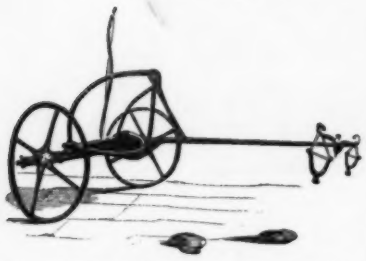
By Edwin Emerson, Jr.

"This is ye rattling, rowling, rumbling age, and ye world runneth on wheeles."—Taylor's "*Oddes Twixt Coaches and Carts,*" 1623.

EVERY orthodox wheelwright knows that the earliest vehicles on record were those which King Pharaoh misguidedly drove into the Red Sea. Even John Taylor, the first and most formidable foe to all wheeled contrivances, in his bitter arraignment of the early hackney coaches of Queen Elizabeth's time was constrained to make this puritanical concession to Bible lore: "'Tis to be supposed how Pharaoh's charriots that were drowned in ye Red Sea, were no other things in shape & fashion, then our Coaches be in this time, and what sore pitty is it, that ye makers and memories of them had not been obliviously swallowed in that Egiptian downfall?"

For a wonder the most learned archæologists, as well as the devoutest of theologians, are inclined to agree with the simple wheelwrights that the Egyptians were indeed the first men versed in the art of carriage making. Ezra Stratton, the author of the most exhaustive English book on the subject, thinks with Aristotle that the ancient Egyptians evolved their chariots from sledges, similar to the horse-drawn tepee poles of our North American Indians, by dragging them over solid rollers.

If this was the case it must be admitted that the gulf from the common flat roller to the wheel, as we know it, was very completely bridged, for the earliest example of an Egyptian wheeled vehicle, brought forward by Mr. Stratton in support of his hypothesis, shows an elaborate affair with a wagon body, tongue and four eight-spoked wheels. Notwithstanding the weight of this writer's acknowledged authority, it seems more than likely that the enthusiasm of his convictions on this subject seduced him into accepting this obviously late representation of

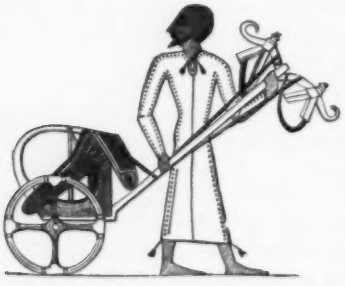


Egyptian Hunting Chariot in Florentine Museum

a wagon for an earlier type. It is highly improbable that a wagon on four wheels, with eight spokes, should antedate the well-known primitive chariot of the Egyptian kings which the early sculptures at Karnac reveal to us, charging into the thick of the fray, borne by two slender wheels with but six spokes apiece. By the same evidences it is made plain that six spokes were only used as an extra allowance for fighting chariots, whereas all the common carts had wheels with only four spokes. As it happens, a perfect specimen of an Egyptian hunting chariot is preserved in the Florentine Museum, which proves that these early sculptured pictures are singularly correct in detail. A still more valuable piece of proof is the fragment of an early Egyptian war chariot found in a mummy pit at Dashour, which is now preserved among the most precious relics of the New York Historical Society.

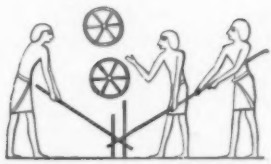
The Oldest Wheel
(Preserved by the New York Historical Society)

It is a wheel two feet eleven inches high without, and three feet three inches with its *wooden* tire. The hub, which is fourteen and a half inches long, five inches through the middle, and four and a half inches at the ends, has not the least appearance of ever having been burdened with an iron box, and the jagged pin ends look as though they had undergone many hard rubs from the linchpin (probably a wooden pin) while revolving around the axle tree. On the face of it it is quite clear that this particular ancient wheel rotated around its



Egyptian Plaustrum (B. C. 1500)

Rimming a Wheel



Bending Timber for a Chariot

axle and not with it, as some learned archæologists would have us believe.

The spokes, six in number, have a peculiar ornamental finish of their own. That which strikes the eye of the practical wheelwright most forcibly is that they have square "tangs" where they enter the felloes, a peculiarity now only found in old-fashioned heavy wheels. The tire-shoeing is unique, no evidence of the use of iron in any form being used thereon. This proves the wheel to be of the most ancient type, since the Egyptians are known to have used iron early in their history. In the British Museum is an Egyptian iron anvil, like those now in use in our smithies, which was unearthed among other remains known to be more than three thousand years old.

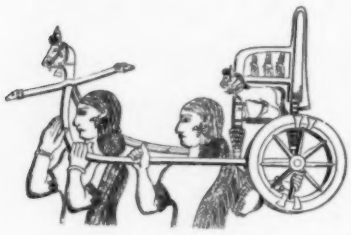
The manner in which ancient Egyptian wheelwrights plied their trade has fortunately been transmitted to us in the bas reliefs on the walls of an edifice erected by Thothmes III., at Thebes. Among the tools represented in the hands of the sculptured figures the most notable are a small wood saw and a semicircular knife for cutting leather, both of which implements are still used by modern mechanics in the selfsame form as was here pictured more than three thousand years ago.

The chariot of the Assyrians was heavier and lower than that of the Egyptians, and the wheels were set farther back, on the theory, evidently, that this would make the body of the chariot more stable. What the vehicle lacked in grace of build it made up in more elaborate ornamentation. The wheels were higher and appear to have had iron spokes. In the sculptured representations of Assyrian chariots, at all events, the spokes appear

Making the Tongue and Yoke

Finishing the Sides and Trimmings

very light and frail, whereas the rims look as thick as modern pneumatic tires. This surmise is corroborated by the fact that the fragment of a car wheel has been found at Ninevah on the concave side of which still remain the iron roots of spokes.

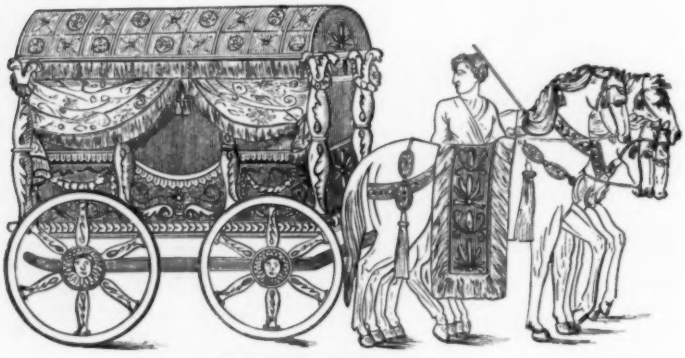


Assyrian War Chariot

The best of these chariots were inlaid with gold and silver, as recorded on a statistical tablet at Karnak, which boasts of "thirty chariots worked in gold and silver and painted poles," brought as trophies from that country. From this passage in Zachariah it would seem that ancient spans of horses were paired according to their color, just as nowadays:

"And behold, there came four chariots out from between two mountains; and the mountains were mountains of brass. In the first chariot were red horses, and in the second chariot black horses, and in the third chariot white horses, and in the fourth chariot grizzled and bay horses."

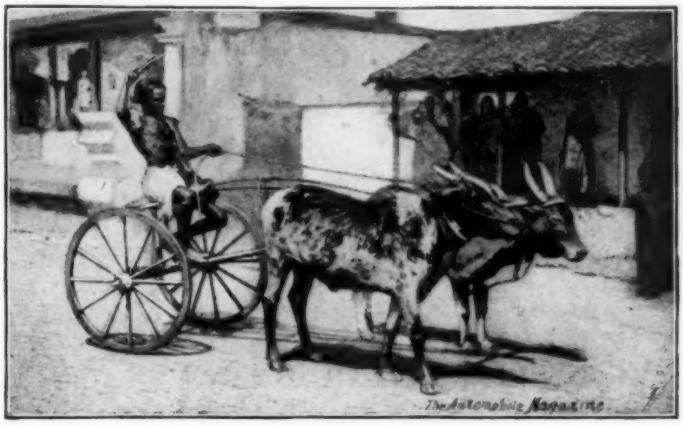
While the Greek and Etruscan wheelwrights in their productions of vehicles clung to the essentials of the chariot type evolved by their predecessors, the ancient Persians branched out and produced new types of their own. Not only were they the first to employ comfortable four-wheeled vehicles with carriage tops and cushions inside—to wit, the harmamaxa, denounced as effeminate by the Greeks—but they also startled the world by the most



Ancient Persian Harmamaxa

Modern Persian Cart
(From Ezra M. Stratton's Work)

ingenious and formidable war engines yet contrived on wheels. These were the famous scythe-and-sickle wagons which they precipitated down upon their invaders from mountainous heights. Just how they were constructed has been the despair of such learned writers as Quintus Curtius, Plutarch, Roger Bacon, Drakenborch, Ginzrot, Scheffer and Stratton. While these scholars have puzzled over the probable arrangement of the murderous cutlery upon the wheels and body of the wagons, it has been reserved to M. Carteret, the author of " The Genesis of the Auto-



Native Cart in Madras

Hindoo Zebu Wagon

mobile," to point out that these curious vehicles were in fact the earliest instance of self-propelled vehicles.*

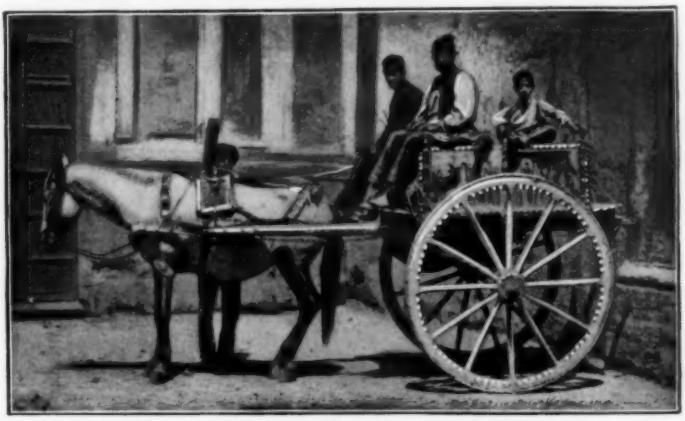
The harmamaxa of the Persians was ultimately adopted by the Romans and gave rise to various four-wheeled types, such as the curriculus, rheda, benna, clabularius, arcera, carucca and the four-wheeled plaustrum. After the overthrow of Rome, when the Barbarians swept over the ancient world, these various well

Hindoo Pony Cart

* See October number of the "Automobile Magazine" for M. Carteret's treatise and for an illustration of one of these fighting machines.

Japanese Jin-Riksha

developed types of pleasure vehicles and workaday wagons degenerated once more into crude carts, such as still survive in their most primitive form in the Roman campagna and the Persia of to-day. The best of these, so all travelers are agreed, is the old fashioned *volante* of Cuba, a two-wheeled vehicle hung in leather springs after the fashion of our forefathers' gigs.



Sicilian Cart

Similar rudimentary bullock carts and pony gigs are to be found among various semi-races and peoples of more or less arrested development throughout all over the world. A peculiar

Ox Sledge of Madeira

exception are our North American Indians, who, adaptable horsemen as they have proved themselves, have never taken to the use of anything that runs on wheels.

This was likewise the attitude of the knights and nobles of the Middle Ages. Since "chivalry," as the original sense of the word indicates, resolved itself into horsemanship, your mounted cavalier had a fine contempt for any other conveyance. The furthest he would condescend was to the horse-litter, a mode of conveyance which is still used by the Catholic clergy in Spain and Portugal.

In England the Norman horse-litter displaced the ancient chariots of the Britains and the chariot-like carts and four-wheeled hammock wagons of the Saxons. After a couple of centuries, when the three races had become thoroughly blended, the Saxon carts, now called chares, had their innings again, and horse-litters presently fell into disrepute. The latest mention of them is in the diary of Evelyn in 1640.

The first mention of the new conveyance is found in the Chaucerian ballad of the Squyr of Low Degree, who is preferred

by the gentle Princess of Hungary to the promise of a ride in a royal chare:

" The chare shall be covered with velvet red,
With a fringed canopy overhead,
And curtains of damask, white and blue,
Figured with lilies and silver dew.

We still have the Soldan's harness, sweet
The housings hung to the horses' feet,
The saddle-cloth is sown with moons,
And the bridle-bells jingle the blithest tunes.

' But I would rather have,' saith she,
' My loving sqyr of low degree.
Not a gaudy chare nor days of chase
Reward me for his absent face.' "

Another kind of carriage in use at this time was called a whirlicote. In 1380, it is related that Richard II., " being threat-

A Cuban Volante

ened by the rebels of Kent, rode from the Tower of London to Mile-end, in a whirlicote of *olde time.*"

Plainly the whirlicote was out of fashion, being superseded by coaches, newly imported from France. Their introduction in England is credited to Queen Eleanor, who died in 1291. Her death was thus amiably discussed in a ballad of the time, enti-

Medieval Long Wagon

tled " A Warning Piece to England Against Pride and Wickednesse, being the fall of Queen Eleanor, wife to Edward, King of England, who, for her pride, by God's Judgements, sunk into the ground at Charing Cross, and rose at Queenshithe:

> She was the first that did invent,
> In coaches brave to ride;
> She was the first that brought this land
> To deadly sin and pride."

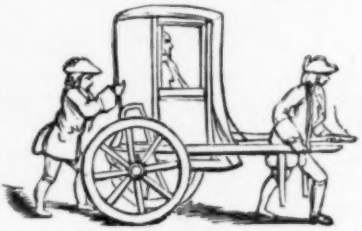
Later testimony, no less direct, credits the first introduction of coaches to Sir Thomas Chamberlayne, English Ambassador to the Court of Charles V. of Spain; and again to the Earl of Rutland, for whom Walter Rippon, Queen Elizabeth's subsequent coachmaker, is recorded to have built the " first coach that ever was seen in England, Anno Domini 1555."

However this may be, a great stir was certainly made in England by the magnificence of the royal coaches which Queen Bess received as presents from her admirers abroad. Her admirers at home followed suit. Thus Sir Philip Sidney risked his knightly reputation by appearing in a coach, instead of on horseback, riding into Shrewsbury in his wagon, " with his trumpeter blowynge, very joyful to behold." Good Bishop Hall, in his " Satires," published shortly afterward, took a less joyful view:

> " Is't not a shame to see a groome
> Sit perched in an idle chariot roome.
> That were not meet some panel to bestride,
> Sursingled to a galled hackney's hide. "

Queen Elizabeth's Coaches
(From Hufnagel's Print)

In spite of such criticisms the use of coaches grew apace, so that young Shakespeare could earn a livelihood by holding the coach horses of the ladies that drove to the Globe Theatre. In 1601 a bill was actually brought in Parliament " to restrayn the excessive use of Coaches within this realm of England." In 1610 a royal patent was granted for the first English stage coach. Licenses for hackney coaches followed soon after, and became so numerous that the Thames watermen in London rose in riot against them. By 1630 there were more than a hundred. Acts of Parliament followed in rapid succession, limiting the number of hackney horses first to 200, then 400, then 600, and 800, until the thousand mark was passed before the end of the century.



Eighteenth Century Brouette

As the coaches increased in number they became better in quality. Samuel Pepys, in his gossipy diary, records such innovations as the first trial of carriage springs and sliding glass

Twentieth Century Victoria

windows, and dilates with pride upon the fine upholstery he was able to put into his own private carriage, the possession of which brought him under suspicion as a bribe taker.

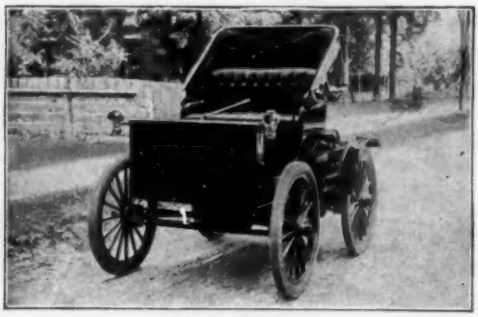
From that time until the present day English speaking men have excelled in the art of carriage building, and the highest peers of the realm even vie with one another in this field. Thus it has come about that such high names as those of Lord Brougham, Hansom and the Earl of Stanhope have become almost more familiar to the world as the immortal names of carriages, than of English noblemen. Even the name of Queen Victoria, we dare say, is kept more green by the familiar style of carriage known as the Victoria.

Now, however, a new vehicle has arisen, different from all that has gone before, with a future opening before it so bright and resplendent that the triumphs of past ages must pale and sink into insignificance.

A Modern Tally-ho

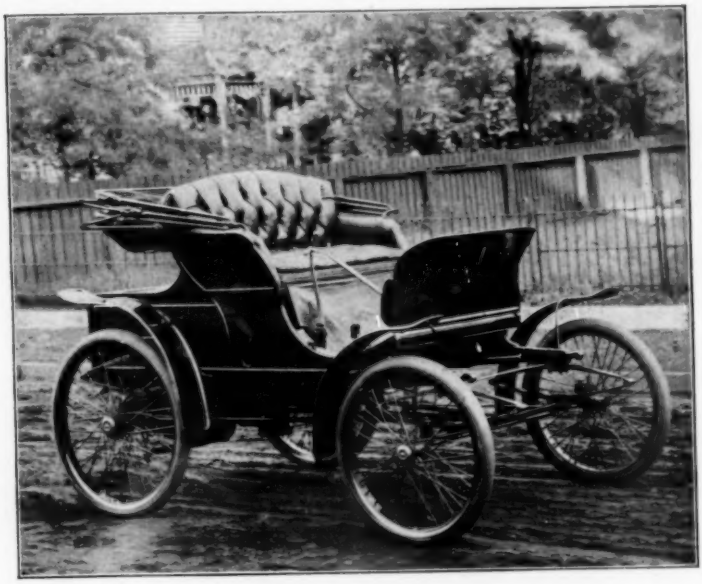
Columbia Electric Prize Racer

Gallery of American Automobiles



Haynes Gasoline Buggy

A Stanley Buggy



Winton Gasoline Phaeton

Winton Gasoline Racer

Gallery of American Automobiles

Overman Tea Cart

Electric Phaeton

Mechanical Propulsion and Traction

By Prof. G. Forestier

I.—The Conditions of Animal Traction Recalled.—There are numerous vehicles of different natures drawn upon roads by animals, that satisfy various exigencies.

In the first place, there is the transportation of merchandise, which is effected through two-wheeled carts or four-wheeled trucks, to which are harnessed horses of slow gait, whose speed varies from 2 to 2½ miles an hour. This service, which was formerly of a most important character, was assured in France in two different manners:

(1) By *ordinary conveyance*, in which the same horses made the entire trip in walking for about eight hours every day and resting the remainder of the time in order to start again the next morning—the daily travel being nearly 19 miles.

(2) By *quick conveyance*, in which the speed was not sensibly greater, but in which the horses succeeded each other by relays—the wagon running day and night. The distance made in twenty-four hours was about from 55 to 60 miles.

Concurrently with the conveyance of merchandise there was at one time the carriage of sea-fish, say, between Dieppe and Paris, for example. This was effected by two-wheeled vehicles to which were harnessed five horses moving on a trot and succeeding each other by relays 7 miles apart. The speed of the animals was about 5 miles an hour, and the distance covered amounted to 114 miles in twenty-four hours.

Afterwards came the carriage of passengers along with merchandise, a service which was formerly assured upon all the national highways by stage coaches, to which were harnessed five horses moving on a trot at an average speed of 5 miles an hour. The mean distance apart of the relays was 7 miles. The distance covered was here again 114 miles in twenty-four hours.

The carriage of despatches was effected more expeditiously, say at a speed of about 7 miles an hour. Later on, when the service of making connections with the railway had to be assured, the despatches, and even the passengers, were carried at a speed

of 9½ miles an hour. Such a speed, which could be obtained only by putting the horses to a gallop for a part of the time, wore the animals out very quickly.

In addition to these public services there is the conveyance of individuals by hired coaches or private carriages. The speed of the hired coach varies between 5 and 7 miles. The distance traveled per day is very variable, say from 25 to 40 miles, according to the load and the value of the team. As a type of such carriages we have the hacks, which formerly had an average speed of 5 miles, but which, under the pressure of the exigencies of the public, now cover as many as 9 miles an hour, when they are hired by the distance. When they run by the hour, however, they make scarcely more than 6 miles.

As for private carriages, their speed never descends below 7 miles, and very frequently reaches 10. There are some, even, which attain 12 miles an hour; but, at such a gait, their team cannot, in a regular manner, make more than 15 miles every day.

Such speeds appeared for a long time to be amply sufficient; but, at present, railway trains are attaining a commercial speed of from 45 to 48 miles, while the public is demanding 60, and even hoping for 75 miles an hour. The passenger who lands from an express train in order to take a transfer coach finds the 5½-mile speed of the vehicle that is taking him to his destination by far too slow.

On another hand, the speed of the pedestrian is from 2 to 3½ miles at the most; but, with the bicycle, it is now a common thing to obtain a speed three times greater, say 10 miles an hour—a performance better than that of the private horse.

The need of speed has therefore entered into our mode of life.

Now, all that we have just recalled shows that it is not possible for animal traction to satisfy this requirement economically. The horse, in fact, is incapable of making, day by day, at a fast gait, the somewhat lengthy journey of 10 miles an hour without standing a chance of becoming worn out in a very short time.

The need of going faster and faster, in covering longer and longer distances, can be satisfied by mechanical traction alone. Aside, too, from the question of speed, the carriage of heavy loads in bulk is, under certain circumstances, if not impossible, at least too onerous with animal traction. In fact, the average load that can be imposed upon a horse decreases very rapidly with the number of the animals forming the team.

In former transportations a total load was reckoned as:

3,168 lb. for 1 horse of 790 lb., say, on an average, 3,168 lb. per horse.

6,327 lb. for 2 horses of 790 lb., say, on an average, 3,163 lb. per horse.
8,652 lb. for 3 horses of 790 lb., say, on an average, 2,884 lb. per horse.
11,220 lb. for 4 horses of 790 lb., say, on an average, 2,805 lb. per horse.
11,935 lb. for 5 horses of 790 lb., say, on an average, 2,387 lb. per horse.
11,972 lb. for 6 horses of 790 lb., say, on an average, 1,995 lb. per horse.
12,058 lb. for 7 horses of 790 lb., say, on an average, 1,723 lb. per horse.
12,056 lb. for 8 horses of 790 lb., say, on an average, 1,507 lb. per horse.

Such diminution of the mean load, while the number of horses composing the team decreases, is due to two causes: In the first place, to the fact that the more horses that the driver has to manage, the less he is capable of keeping them on the move and of making them act well in unison; and, in the second place, to the fact that the mean load imposed upon each horse depends upon the effective stress that he will be able to exert at certain parts of the journey; at the curves met with upon the road, for example.

In fact, a team composed of several horses may be considered as forming a regular polygon. The pull exerted by the first horse is not parallel with the direction of the second, and therefore gives a component at right angles therewith. In like manner the sum of the traction of the second horse and of the component of that of the first, parallel with that of the second, will be oblique to the direction of the third horse, and so on.

It is easy to see that the different components at right angles and parallel with the positions occupied by the successive horses are given by the relations:

$$Tn = T\sin\alpha\,(1 + \cos\alpha + \cos^2\alpha + \ldots \cos^n\alpha)$$
$$Tp = T\,(\cos\alpha + \cos^2\alpha + \ldots \cos^{n+1})$$

Where n is the order number of the horse counted as beginning from the leader, for which it is 1; and α is the angle at the centre corresponding to the side of the regular polygon formed by the team as a whole.

It results therefrom that while the component at right angles with the direction of each horse increases very rapidly (thus interfering with its useful action), the sum of all the useful components is notably less than the number of the animals of the team.

The relations:

$$\text{Sin } \alpha = \frac{l}{R}\sqrt{1 - \frac{l^2}{4R^2}}$$

$$\text{Cos } \alpha = \sqrt{1 - \frac{l^2}{4R^2} + \frac{l^4}{16R^4}}$$

—where l is the distance from collar to collar, and R is the radius of the curve, show that this disadvantageous influence of the curves increases with l and decreases, on the contrary, when R increases (usually $l = 8.2$ feet and $R = 130$ feet upon the national roads of France).

If, instead of presenting a curve of a wide enough radius to allow the team to spread itself without inconvenience, the road makes an abrupt turn (as happens in the streets of a city), the shaft-horses alone will be capable of pulling efficaciously; and if the load is somewhat heavy, the team, as numerous as the horses that compose it may be, will not be utilized, unless the precaution has been previously taken to impart sufficient speed to the vehicle to allow the live force acquired to permit of making the difficult passage.

As a usual thing, the number of horses given to a teamster to drive in tandem is but five. The total maximum load would therefore be about 11,935 pounds, if the weight of the horses should remain at an average of 790 pounds.

The average maximum load that five strong Boulonnais horses can be made to draw is now notably greater, especially when the journey is not too long. Aside from the fact that the trucking business has much heavier, and, consequently stronger, teams at its disposal, the roads offer it more satisfactory conditions of viability. Thus, at Paris, there exist heavy trucking enterprises, especially for the carriage of dressed stone, in which five or six horses at the most haul a total load of 26,400 pounds. The daily travel is, on an average, 36 miles, in four trips—two with a load and two without. The truck weighs 7,300 pounds. The five or six horses are driven by one teamster. The weight of the shaft horse is 1,617 pounds and that of the tandem horses 1,450. The average load varies between 4,400 and 5,280 pounds.

A fine example of regular service that may be cited in this connection is the carriage of bags of sugar for the Say Refinery. One hundred bags of 220 pounds each are carried at a load. This effective load of 22,000 pounds is placed upon a truck weighing 9,900 pounds. The total weight is therefore 31,900 pounds. In

order to draw this vehicle, it takes but five horses, of which the average load amounts to 6,380 pounds. The weight of the animals is:

Tandem horses	1,470 pounds.
Shaft horse	1,600 "

On another hand, the team works, under a load, for from two and a half to two and three-quarter hours at the most, rests during the unloading of the truck, and then returns without a load in order to begin again a second similar trip. The co-efficient of traction in the routes followed in Paris may be estimated at more than 55 pounds per ton. Each horse therefore exerts upon a level a maximum stress equal to from 10 to 11 per cent. of its weight. For a trip of about 5¼ miles, the speed is, on an average, about 2⅕ miles an hour.

As an example of the carriage of an exceptionally heavy indivisible mass, no better example can be selected than that of the transportation of the bell called the "Savoyarde" from the station of La Chapelle to Montmartre Hill at Paris, in 1895. The bell weighed 36,300 pounds, and the truck upon which it was carried 13,200 pounds. In order to haul this total weight of 49,500 pounds over a road with quite pronounced declivities, a team of 28 horses in tandem had to be employed. This corresponded to a mean load of about 1,760 pounds. It was possible to obtain such a stress only by giving each horse a driver. In order to carry the bell to the inclined plane over which it was to be moved to its place, not only was a selection made of a route that presented the fewest sinuosities, but upon a portion of the way the team had to be urged to extreme speed.

In case the carriage of such loads were frequent, there would be a manifest economic interest in discarding animal traction and substituting mechanical traction for it.

Rapidity in the conveyance of passengers and despatches, and economy in the moving of heavy indivisible masses; such are the reasons that justify the substitution of mechanical for animal traction upon roads.

II.—Comparative Conditions of Operation of Mechanical Traction upon Rails and Highways.—Some persons might think that in order to succeed in substituting mechanical for animal traction upon roads, it would suffice to copy more or less intelligently the engines used for traction upon rails. Many experiments were for a long time made in this direction, but all of them proved dismal failures. The conditions, in fact, are very different; and we shall pass them rapidly in review. This

study will permit us at the same time to understand why mechanical traction upon roads, the first in date, has remained so long in limbo, while mechanical traction upon rails has so rapidly become flourishing.

Mechanical traction upon rails was at once provided with a trackway admirably adapted to its requirements. Struck by its economic power, capitalists recoiled before no sacrifice in order to make it a success. It was therefore protected against the jarring and violent shocks resulting from obstacles that have to be surmounted upon public roads. The rails, laid at the outset almost always on a level and in a straight line, or according to curves having a radius of over three thousand feet, assured it an almost constant stress, and, at the same time, permitted it to use a relatively heavy motor, separate from the cars to be hauled. Such separation allowed of the use of stiffer springs upon the motor than upon the passenger cars. This, along with the absence of abrupt vibrations, allowed of a rigid connection of the cylinder (fixed to the frame) with the driving axles—the elasticity of the steam permitting of sufficient play to prevent possible slight variations in distance.

As the rails assured a rectilinear direction, the engineer had merely to occupy himself with the management of his locomotive and furnace. The track, carefully isolated by continuous fences, protected the engine and its mechanism against all accidental collisions. The essential parts of the motor could therefore be placed upon the exterior. At the same time, the absence of dust permitted of leaving them in the open air and easy of inspection. In like manner, as the wheels had to move in a straight line, it was possible to key them upon the axles, since both had to revolve with the same velocity. Moreover, protected against lateral shocks, they could be plane. The absence of all violent jarring obviated the necessity of giving them elasticity and permitted of the adoption of metal for their manufacture.

Finally, although the necessity of placing the platform of the cars or the floor of the passenger coaches at a slight height above the ground, in order to facilitate the ingress and egress of passengers or the handling of freight, rendered imperative the use of wheels of small diameter for both cars and coaches, the stability of the latter permitted of the adoption of easily filled oil-boxes that greatly diminished the resistance to friction, despite the relatively large size of the journals necessitated by the heavy load carried by the axles.

Hence the gigantic strides that mechanical traction upon rails has been able rapidly to make, thanks to the pecuniary resources

of all sorts that were justified by its influence upon the economic government of nations.

On the other hand, let us see what obstacles have had to be surmounted by mechanical road-traction, which, more modest in its results, has been able to make an advance only through the enthusiasm (sometimes injudicious) of inventors.

The resistant work to be overcome by the motor does not consist solely of the obstacles to traction that are offered by the road and by the sliding friction of the journal in the axle-box, due to the dead weight and effective load, but comprises, also, as with locomotives, sliding and rolling frictions of the various parts of the motor itself and of the transmission of motion from the latter to the driving wheels.

In traction upon common roads, such causes of loss of motive power are notably aggravated by the very peculiar difficulties of transmitting the power of the motor to the driving wheels. Here, in fact, the frame to which the motor is fixed rests upon the axles through the intermedium of springs, which, in order to overcome shocks due to jolting, must be elastic enough to protect the mechanism, as well as the passengers, against troublesome jarring. The elasticity of the springs increases the amplitude of the relative displacements of the extreme points of the transmission. Hence the latter must comprise distortable parts that render the co-efficient of utilization of the initial power of the motor more feeble.

On another hand, although the straight line is the normal direction of the vehicle upon rails (requiring the keying of the wheels at the extremities of a rigid axle), it may be said that the sinuous path is the rule for the vehicle upon roads. In fact, the two wheels of the same axle never meet with the same conditions at the same time, and, moreover, cannot be actuated with the same velocity. Hence the necessity of transmitting to each wheel, at every instant, a variable proportion of the motive power. Hence, too, a special difficulty of transmission—a new cause of loss. From the moment at which the power of the motor is inevitably so poorly utilized, it is important that the initial resistances applied to the wheels shall be reduced to a minimum.

The success of mechanical traction upon roads does not, therefore, depend so much upon the motor, properly so called, as upon obtaining the following desiderata: (1) A reduction to a minimum of the external stresses that oppose themselves to the motion of the vehicle; and (2) a possibility of transmitting simultaneously to each wheel that portion of the power that is necessary to it, according to the resistance that is momentarily opposed to it.

In order that, without detriment to the safety of those that it carries and of those that it is liable to meet, the traction vehicle may acquire all the speed that is compatible with its stability, it is well, besides, that it shall be provided with strong as well as efficient brakes, and with a steering apparatus that can be maneuvered with certainty and rapidity.

All such questions solved, there will be reason for seeking a motor (1) that shall be as light as possible; (2) that shall utilize an easily supplied source of energy; (3) that shall be capable of developing a power variable with the necessities of the traffic; and (4) that shall be as well balanced as possible.

Before passing successively in review the solutions proposed for these different problems, we shall give a succinct history, not of all the vehicles that have been experimented with one after another, but only of such trials made by different inventors as seem to us to have most influenced the conditions that at present confront the construction of a power carriage.

III.—Succinct History of the Successive Progresses Made by Mechanical Propulsion upon Roads.—The first person to construct a mechanically propelled vehicle was Cugnot, a French military engineer, whose experiments date back to 1769. His mechanical vehicle, with a load consisting of four persons, was capable of running upon a level at a speed of from 2 to 2½ miles an hour.

Unfortunately, its boiler did not possess an adequate vaporizing power, and, at the end of a quarter of an hour, it was necessary to stop for almost the same length of time in order to allow the pressure to rise. Moreover, as the furnace door was placed in the rear, the vehicle had to be stopped when fuel was to be put into the furnace. Nevertheless, the tentative was judged so interesting that Minister de Choiseul gave an order for the construction of a vehicle capable of attaining a speed of 2½ miles an hour with a load of from 8,000 to 10,000 pounds. This vehicle, which was finished in 1770, cost about $5,500. It is preserved at Paris in the collection of the Conservatoire des Arts et Metiers.

We omit everything that concerns the boiler and engine, notwithstanding the great interest presented by the latter, and shall occupy ourselves with the vehicle only. As may be seen in Fig. 1, this is a tricycle of which the single front wheel is both a driving and steering one. The apparatus consists of two distinct parts:

(1). The vehicle, properly so called, formed of a strong frame provided at the back with an axle and two large wheels, and in

front with a circular plate bearing upon two rollers fixed to the following piece;

(2). A metallic frame carrying the boiler and engine, and resting like the beam of a balance upon the extremities of the axle of the front wheel through two pieces of bronze analogous to the axle guards of our present cars.

The boiler, placed projectingly in front of this frame, would have had a tendency to cause the front part to tilt had there not been fixed to the latter two lateral metallic pieces carrying rollers upon which the vehicle, properly so called, rested through the intermedium of its rolling plate.

In order to steer the vehicle, the driver had at his disposal a horizontal bar provided with two grips and mounted upon a vertical shaft, which, at the level of the floor of the vehicle, carried a pinion that geared with a toothed wheel mounted upon another vertical shaft passing through the frame of the vehicle, beneath which it carried a pinion that geared with a toothed sector fixed to the metallic pieces to which were adjusted the axles of the rollers.

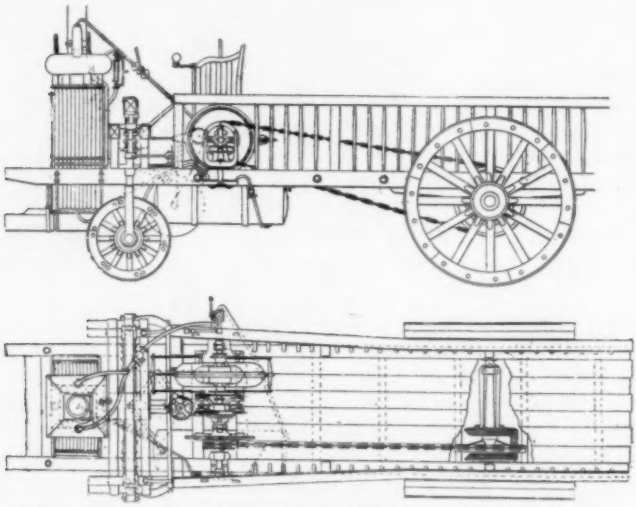
This very intricate arrangement did not permit of a rapid enough action. At the same time, it is probable that, under the influence of jolting, the gearings would not have continued to mesh with each other. Thus is too easily explained the legend according to which, on the day of the experiments, the vehicle, upon coming from the shop in which it had been constructed, took on a speed such that its driver, powerless to steer it, could not prevent it from running against a wall that happened to stand in its way. This accident put an end to the only trial that was ever made of it.

Another point in the construction of this vehicle is worthy of attracting our attention. In order to keep in easy relation the motor and the wheel that he desired to be both a driving and steering one, Cugnot found no other means than that of placing the steam cylinders above the axle of this wheel, so that the whole displaced itself at the same time. Being unacquainted with flexible joints he had to proceed in the same way with the boiler, and hence a considerable overhang of the latter in front, which could not have been without an influence upon the difficulty attending the maneuvers of steering.

After Cugnot, numerous other inventors made researches upon the mechanically propelled carriage. Among the experiments that took place up to 1828 there were some that were of the most curious character, from the view point of the history of

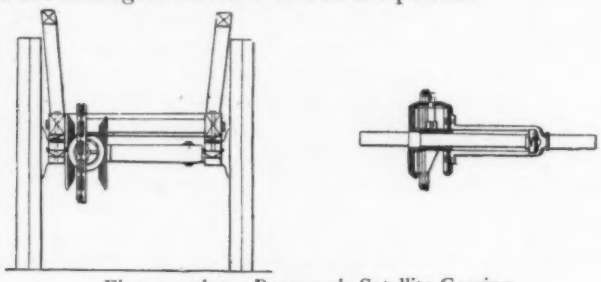
the steam engine, but that brought to light no fact affecting the vehicle itself.

On the contrary, we have to point out several very interesting arrangements, in connection with the subject that occupies us, in the steam carriage designed for running upon ordinary roads, and that was patented at Paris in 1828 by Onesiphore Pecqueur, superintendent of the shops of the Conservatoire des Arts et Metiers (Figs. 2 and 3).



Figs. 2 and 3. Elevation and Plan of the Pecqueur Steam Wagon.

The driving wheels, which were two in number, were keyed upon the hind axle, which consisted of two parts connected by a satellite gearing, the original of the differential gearing now in use (Figs. 4 and 5). The following is the principle of it, according to the arrangement described in the patent:



Figs. 4 and 5. Pecqueur's Satellite Gearing.

Upon one of the two parts of the axle was keyed a bevel wheel. The other part carried a sleeve to which was keyed another bevel wheel symmetrical with the first. Between the two revolved a grooved pulley, around one of the spokes of which was capable of turning a bevel pinion that geared with the two symmetrical bevel wheels. The motion of the motor was transmitted to the pulley through a chain that passed through the groove. This pulley, therefore, revolved, and the pinion mounted upon one of its spokes actuated the two bevel wheels fixed to the two segments of the axle.

When either of the wheels experienced a resistance different from that of the other, the speed of the motion transmitted was the same for both, since the teeth of the pinion carried both of them along. If, on the contrary, one of them, in consequence of a curved trajectory, could not revolve freely, the teeth of the pinion displaced themselves (since the pinion was movable around a spoke of the pulley) to a sufficient degree to allow the relative velocities of the two wheels to become what was required by the trajectory followed.

The journals of the front steering axle were not in the prolongation of the latter, but were mounted upon vertical pivots movable in forks placed at its extremities. Unfortunately, these journals were connected in such a way that the wheels always remained parallel instead of having conjugate motions such that their prolonged axes should concur at the same point of the hind axle.

The steering fore-carriage was movable around a king-bolt through the aid of a toothed sector that geared with the lower pinion of the vertical shaft of the steering bar, as in the Cugnot vehicle. In like manner the fore-carriage carried the boiler and the rotary engine. It alone was provided with springs.

It will be seen that the Pecqueur carriage possessed (in an embryo state, at least) all the parts adapted for making a perfect automobile of it. Nevertheless, for want of a knowledge of this precedent, many inventors are going to wear themselves out in vain in useless experiments.

In 1835 an English carriage was introduced into France by Asda, after passing through Belgium. On the 10th of February, starting from Rue du Mont-Blanc, it made the trip from Paris to Versailles and return in four hours and a half, with a stay of forty-two minutes at Versailles. The outward trip lasted one hour and twenty-seven minutes, and the homeward one hour and twenty-one minutes.

The pressure of the steam in the boiler reached 11 atmos-

pheres. The engine was of 14 horse-power. The weight of the carriage and its load was 9,900 pounds. On the 15th of March, 1835, the same carriage made a trip from Paris to Saint-Germain and return in four hours and twenty-nine minutes, inclusive of stoppages at Nanterre going and coming, for the renewal of water, as well as a stop at Saint-Germain, say in all sixty-two minutes.

By reason of the fact that the boiler was replaced by a system of water tubes, the breakage of which would not have been attended with any danger, the *Constitutionnel,* in giving an account of these experiments, asserts that "the least shadow of a danger to passengers has been made to disappear in this English carriage, which, in the ingenious arrangement of its mechanism, presents all the improvements that twelve years of experiment have successively indicated to English engineers."

"Not the slightest accident disturbed the voyage," says the *Constitutionnel,* which adds: "What is certain is that, in a short time from now, one or more regular services will be established from Paris to Saint-Germain and Versailles."

In France, the automobile vehicle seems to have been abandoned for the study of hauling-vehicles. In this order of ideas we may mention, among other inventors, Dietz, who, in 1835, took out a patent for a steam carriage styled a "traction-engine running upon ordinary roads." The first type was a tricycle, but, contrary to what was found in the Cugnot vehicle, the two hind wheels were drivers, and the single front wheel was a steering one. The carriages afterward constructed by Dietz had as many as three pairs of intermediate wheels mounted in guiding plates to permit of following the sinuosities of the road. The general arrangement was evidently inspired by what is practiced on railways. However, Dietz merits special mention, since he seems to have been the first to have a presentiment of the utility of elastic tires. It is useless to say that, having at his disposal no practical means of realizing such desiderata, he had to try various makeshifts, such as interposing, in the first place, a layer of tarred felt, then cork, and then rubber, between the felly and the tire, and holding the same in place by lateral cheeks bolted to the felly. Dietz conceived the idea also of uniting the wooden spokes of the wheels in a metallic box forming a hub.

(To be continued in our next issue)

NOTE.—Specially translated for the Automobile Magazine from *Le Génie Civil*

The Automobile and Public Health

By James J. Walsh, Ph. D., M. D.

IT is evident that the present movement in automobilism will soon bring us to a practically horseless era in our cities. It is interesting, therefore, to anticipate some of the effects on the public health of large centres of population that the absence of the horse is sure to have. The sanitary benefits that will accrue from his removal, though entirely unlooked for by most people, are rather easy to foresee. Of themselves these prospective sanitary advantages are enough to make the coming of the horseless era a boon, and it is surprising that the advocates of automobiles have not made more of this most telling point in their favor. For one thing, the absence of the horse will probably entail the absolute eradication of tetanus—lockjaw, as it is commonly called—from our cities, at least. The disease, though fortunately not common, is by no means rare. Some 80 cases were reported from the neighborhood of New York City alone last summer. The very high mortality of the disease, from 60 to 90% of those attacked, makes it a dreaded visitor in our hospitals, a most unwelcome claimant on the attention of physicians. Medical and surgical intervention so far has not been able to check its effects. The discovery and preparation of a specific anti-toxine for the disease some years ago it was hoped would lessen its fatality, but the hope has proven vain.

It is the usual story every year to have a series of cases of the disease under treatment at the hospitals of all our large cities just after the Fourth of July. The history of these patients is practically the same in all the cases. There was a wound—often a very slight one, but nearly always incurred from a burn while the patient was on the street. This became contaminated by street dirt. It healed more or less kindly, and sometimes was almost forgotten, when about a week or ten days after the accident some stiffness of the neck and jaw muscles began to develop. It was the premonitory symptom of dreaded lockjaw.

Usually, in spite of every medical effort, the spasm spreads to other muscles until all of the muscular system is involved. Consciousness remains, but as the result of the heat developed by the constant muscular contraction, high temperature sets in and exhaustion supervenes, if the patient does not succumb before this to a spasm of the muscles of respiration.

The cycle of existence of the tetanus germ outside the human body is extremely interesting. The bacillus of tetanus, while itself discovered by the Japanese bacteriologist Kitasato, is one of a class of micro-organisms whose isolation and demonstration by Pasteur many years ago destroyed certain *a priori* assumptions with regard to the conditions indispensable for life. The bacillus is anærobic, that is, lives without air. Not only can it live and multiply in the absence of air, but the presence of that substance absolutely prevents its growth. Its favorite habitat is garden soil. Here, at a certain depth below the surface, it finds in summer time the warmth and moisture and nutritive materials necessary for its luxurious multiplication. Whenever on the stems of grasses, or the like, it is carried from the soil into the air, it enters upon a special stage of its existence and forms spores, seed like bodies which are especially resistent to extraneous unfavorable influences. In this form it is able to retain its vitality despite the presence of air.

Incidentally, the liking of the bacillus for the farm makes wounds that are incurred from farming implements especially liable to be complicated by tetanus. While in this spore stage the bacillus of tetanus is carried on hay, straw and the like to our cities as fodder for horses. After being eaten the tetanus spores find in the horses' intestines an ideal breeding place, with just the warmth, moisture and absence of free oxygen that are so favorable to them. At once they begin active reduplication. They do not affect the horse himself, for after all they are not inside the animal. They are not absorbed. They are only for the moment within the hollow cylinder that every animal, in its simplest expression, really is. Largely increased in numbers they pass out with the excrement, to dry on our city streets and be blown hither and thither by the winds.

Knowing all this, one might be surprised that tetanus is not more common than it is, or might wonder why nearly every wound incurred on city streets is not followed by tetanus. Owing to its absolute anærobic life, however, a certain combination of circumstances that, fortunately, is not very frequent, must conspire to give the bacillus a foothold in human or animal tissues. Even on human blood serum the tetanus bacillus will not grow in the presence of air. For successful inoculation the wound of entrance must be of such a character that the bacillus finds its way beneath the surface into the tissues and away from the air. Such wounds are characteristically those made by penetrating farm implements, as garden rakes, or pitch-forks, or the well-known rusty nail, or the lacerated wounds produced by toy or

other pistols. In the depths of such wounds the tetanus bacillus finds a safe refuge and a favorable nidus for breeding, out of reach of the disturbing oxygen of the air.

In our cities the absence of the horse would practically do away with all danger from the bacillus. It would render unnecessary the importation of farm products, like the grasses on which the tetanus germ flourishes by preference; and it would do away with the breeding places of the bacilli in our cities, namely, the warm, moist droppings of the horse, in which they find an abundance of organic material for their nutrition and the necessary absence of air.

Besides tetanus there are other diseases which can be traced directly to the horse, but which are only communicated by actual contact with the animal. Actinomycosis, for instance, and certain acute coryzas, as epizootic, are common to men and horses. As they effect only those, however, who are associated a great deal and very closely with the horse, they may be properly passed over in an article on public health.

We have come to think in recent years, however, that there are other forms of bacteria besides the tetanus bacillus that find in the animal gastro-intestinal tract an ideal incubator ready to hand, besides an abundance of suitable nutrient media. Prof. Nothnagel, of Vienna, probably the most distinguished living specialist on diseases of the digestive tract, states that more than three-fourths of the fæces of the human being is made up of bacteria. In the herbivorous animals there is much more residue from the food, more indigestible products as cellulose to be found in the fæces, but still it is a perfectly safe approximation to say that considerably more than one-half of the intestinal excrementitious material of even the plant eating animals consists of microorganisms. It is not difficult then to realize the immense number of microbes that find their way into the air from equine excrement. Not all of these are harmful; that is, disease producing or pathogenic, as it is called. On the contrary, only a very small proportion of them are liable to produce any disturbance in the human system, except under special circumstances. It is well known, however, that a certain number of the intestinal bacteria that cause disorders of disgestion in man find a favorable breeding place in the gastro-intestinal tract of the horse. A form of the colon bacillus have been demonstrated there, and, while this is a most variable bacteriological family, at times possessing a good deal of virulence, at others being almost harmless in action, and apparently a normal inhabitant of the human intestine, there is at least an ever present danger from their plenteous distribution

in the air through the almost constant presence of drying horse droppings on our streets.

Especially are the intestinal bacteria thus fostered liable to affect the weaklings of our population—irresistive invalids, chronic sufferers from intestinal troubles and infants. The unwelcome addition from this source in the summer time to the already abundantly luxuriant flora of the child's gastro-intestinal tract is surely a fruitful cause of digestive disturbance. Milk, water, the hands, bottles, nipples and the like become contaminated with these bacteria, unless most scrupulous and not always perfectly possible precautions be taken. Something of the prevalence of cholera morbus and dysentery among adults in the summer time is due to the same cause. The horse is practically the only animal that has the freedom of our city streets now, certainly the only one whose intestinal bacteria are scattered plentifully enough in crowded centres of population to constitute a source of danger.

Finally there remains an indirect way in which the horse has an influence on public health. Some one said not long ago that if the horse were done away with, it is probable that we would escape entirely, or at least in great measure, the plague of flies that afflicts us every summer. Flies find their favorite breeding places in stables. They find on the animals themselves a great source of nourishment. If all the stables were removed from our cities it is more than probable that the total eradication of the little pests would be a question of but a short time and very little trouble.

We have learned to regard flies in recent years as much more important factors in the spread of disease than we used to think. It is not so long since all infectious material was supposed to find its way through the atmosphere of itself, by a process of diffusion as it were, or by actual transportation in currents of air. Of late, however, we have come to consider this spread of disease without the mediation of some agency other than the air itself as extremely rare. Epidemics travel no faster than our means of communications between cities. Diseases are contagious not through the air, or only very rarely so, but because of actual conveyance of infecting material from the sick to the well.

The most active agents for such convoy are flies. Long ago it was known that they carried the germs of anthrax. Malignant pustule and other diseases have gradually been added to the list. During our late war with Spain it was demonstrated beyond all doubt that they can serve as the carriers of typhoid fever, dysentery and other intestinal diseases, and probably also of yellow

fever. Their habit of lighting on all sorts of material and then carrying off portions of it clinging to their feet and bodies makes it easily understood how they may be carriers of infectious material. Gelatine plates over which flies have been allowed to walk, after having been permitted access to infectious material, swarm with colonies of virulent bacteria.

When the biological significance of small amounts of a living contagious material was not realized, it was difficult to understand how such minute quantities of even intensely toxic substances as flies might carry, could have serious consequences. Now that we know that literally the seeds of contagion are thus carried and that these immediately proceed to multiply under favorable conditions with a rapidity scarcely to be imagined, it is easy to comprehend how flies may carry with them to infect milk, water, butter and other articles of food and drink, the germs of practically any contagion.

Their eradication from our cities would be a distinct gain for public health in more ways than our present limited knowledge of bacteriology and sanitation can make clear to us. There would come, as a direct result, at least a marked reduction in the number of cases of typhoid fever. Suppuration in wounds and the suppurative infections would become less common, and the number and severity of intestinal diseases, especially those of the choleraic type so common in our cities in the summer time, would be greatly diminished.

The automobile, then, should meet with a hearty welcome from the professional sanitarian and from all those who are sincerely interested in municipal health. Whatever can be done to advance the day that will usher in the horseless era for our city streets, will be just so much done in a great humanitarian cause. It will lead to a distinct lessening of human suffering, as well be it said parenthetically, to a most welcome diminution of animal suffering, and will prove another link in the chain of sanitary improvements that in our day is lengthening the average of human life so notably and making it ever more and more liveable, because more healthy.

Women and Automobilism

By Miss N. G. Bacon*

IT is incumbent upon the intelligent woman to be interested in life, all its phases and developments. Automobiles and automobilism are not only fascinating subjects for study from the point of view of pleasure, but they offer a marvellous opportunity for the practical utilization of any mechanical talent or ingenuity. Thoughtful women have come to the front during the past few years to study all branches of life's work, and to endeavor, so far as possible, to educate themselves to fill positions of responsibility and trust. Indeed, the march of advancing womanhood towards all points of central energy is one of the most interesting features of this century. Doors that have been closed since the world has been, are to-day open. Professions that were in the years of our foremothers considered above or beneath the capacity of a woman are now recognized as compatible with a woman's dignity and power.

But in speaking of automobilism, we enter the arena of outdoor pastimes and occupations. All of us here can remember the advent of the bicycle, and its reception by that estimable old gentleman, Mr. Grundy.

The old fogeys of Rome could not have been more shocked at Virginia's appearance in the Coliseum than were our "fine old English gentlemen" at the sight of their womankind—self-propelled. This horror, as you will all remember, was real, and it resulted in so strong an opposition to bicycling that it was by no means an uncommon thing for a girl not to dare to ride near her own house, lest the vials of paternal wrath should be poured on her devoted head. But we fought against masculine prejudices and the allied nuisances. Having wheeled for some seventeen years I could speak at length upon this subject if time permitted, but suffice it to say that women owe to the bicycle a freedom and a power never before enjoyed.

The pastime of cycling is all very well, but the motor vehicle gives a foretaste of something better to come. Automobilism offers an advance in the future as inconceivable to the novice of to-day as cycling afforded the uninitiated wheeler of the past. The question naturally presents itself to the mind, what will the

* Paper read at Lady Harberton's house in London.

automobile do for our womanhood? This is a large question, and cannot be answered in an off-hand or slip-shod manner. In any reply that can be made, automobilism must first be divided into departments of pleasure and profit. The automobile is, and may only be, the rich woman's toy; *i. e.,* it may be useful from the point of view of pleasure only, but it can also be considered the professional woman's friend, if viewed from its profit-earning side. As wealth holds a prominent place in this world, it seems desirable to deal first with motoring as a pastime. The efficiency of the motor vehicles of to-day leaves much to be desired, for it offers little scope, if any, for the lady automobiliste who seeks enjoyment of an unique kind. Driving a car in company with a mechanic seated in close proximity to oneself is scarcely agreeable, nor is it yet found to be satisfactory to have the man, no matter where he may be seated, in livery, to act as mechanic at one moment and as footman the next, for the motor-vehicle, by its construction and its peculiar mechanism, requires occasionally special care and attention *en route,* which only a skilled engineer can give. Hence, it is most desirable that women should study the design of horseless vehicles, for comfort is a very essential item and one that should not be despised. I have seen a considerable number of vehicles, but not one as yet that appears to be likely to yield much comfort and ease for long and short distances.

A car that is liable to continuous breakdown is unsuited to the requirements of women. A really efficient automobile, one that performs all that its manufacturer claims, although it may be full of limitations and shortcomings as to speed, vibration, noise, smell, etc., is a more desirable vehicle than one that falls lamentably short of the manufacturer's guarantee.

After design and efficiency come mechanism and propulsive power. Learning to drive a car is a comparatively simple matter, but to understand its working parts sufficiently to have them in full control, and, in case of disaster or breakdown, to regulate its apparently incomprehensible ways, and to restore, without loss of temper or patience, its running powers to a normal condition, require trained skill. There is at the present moment no place where women can be educated to handle tools, or to adjust the machinery of the car they wish to drive. A superficial knowledge may be given by enterprising manufacturers to purchasers of cars that will enable them to drive, and even to understand the general working of the machinery, but more than this is required before lady motorists can be responsible for the manipulation of their cars. It is difficult indeed for experts to detect errors of adjustment, and the cause of the imperfect working of the

machinery, therefore it is imperative that those women who seek to become practical motorists should devote time and skill to the study of the mechanism of automobiles at least sufficiently to enable them to detect what is wrong in case of breakdown, and how to remedy same. It is admitted, I think, that more time is generally spent in discovering the cause of a breakdown than in removing it, for the services of a skilled mechanic can be brought into requisition directly knowledge is obtained as to the nature of the breakdown.

The propulsive energy I refer to last, although it should perhaps come first, for neither the design nor the efficiency of automobiles can be considered until it has been decided definitely whether steam, electric or petrol cars are favored. I cannot here attempt to go into details concerning the driving power of vehicles, for the subject is a deep one, and requires the most careful study.

Granted, then, that women should study the automobile before attempting to enjoy it, I pass to the nature of the pastime. Those who have enjoyed the fascination and the exhilaration of driving through the air, along our public highways, with little or no muscular effort, up hills and down dales, at a high rate of speed, can speak with eloquence in praise of its enjoyment; but even the most eloquent generally finish their eulogistic remarks by saying that no words can adequately describe the sensation. To really appreciate what an automobile is, you must run one. There are no half measures. It is "To be, or not to be." There are, of course, various phases of enjoyment. The most ecstatic I should imagine to be that of whizzing through the air at a breakneck pace, regardless of all else but speed. But, it is whispered, with hand uplifted, that cannot be. By the laws of the land any speed exceeding twelve miles an hour is prohibited. The uninitiated say, "Surely that is enough"; but those who have tasted the delights of motoring, solemnly, and somewhat regretfully, shake their heads and protest, in as mild language as is possible for their feelings, against unnecessary restrictions. Apart from the speed craze, the pleasure of pottering along sweet lanes, surrounded by landscape beauty, must not be despised. It is impossible to touch even the fringe of the subject here, and, therefore, I leave it alone, and simply appeal to the imagination of my hearers in the hope that they may catch the tiniest glimpse of forthcoming pleasures. For my own part my appetite for the automobile has only been sharpened by what little experience I have enjoyed of motor-vehicles. A few years hence I may speak with more knowledge, perhaps with even greater enthusiasm,

and, at any rate, I hope with less opposition, for to me it seems strange that any one should consider it unprofitable for women to study the automobile and automobilism.

I come now to the professional women. Many of us are deeply interested in all agricultural and horticultural pursuits. Various colleges exist for the instruction of women in the arts connected with the cultivation of the land and its produce. Gardening, fruit growing, bee-keeping, dairy produce, and poultry-keeping, are occupations now considered to be adaptable to women's labor, and I think statistics will prove that motor-vehicles are less costly for haulage of heavy traffic. The question of transit of the produce of the land from the door of the producer to the markets is one of special interest to women, for until the nationalisation of our railways is arranged, the problems in connection with rural life are very perplexing.

Sceptics may smile, and render the world unpicturesque by means of their unseemly jokes, jests and caricatures of women driving such vehicles. Women should study the whole question dispassionately and with intelligence, in order to test for themselves whether the motor-vehicle will or will not be useful to them in their various agricultural and horticultural callings, for those who laugh last generally laugh best.

I think I have now covered the whole ground of my campaign. Those of us who seek to form a Ladies' Automobile Club have very unpretentious claims. Indeed, we are modest, for our knowledge is so meagre that all we seek is an opportunity for studying the whole matter, and to do this some centre should be formed around which women interested can gather. The Automobile Club of Great Britain claims the distinction of being "a centre of information and advice on matters pertaining to motor-vehicles, for those who are not owners as well as for owners of motor-vehicles," and yet it closes its doors to more than half the adult human race. Professor Vernon Boys wrote to me lately: "In our membership one touch of motor makes the whole world kind," but I fail to appreciate the logic of such a remark, for how can "the whole world be kind" when, out of a population of some forty millions of people only 500 odd men are members of this Club?

Who could deny even to 1,000 men the privilege of having a *social* club for any purpose whatsoever? But they cannot logically expect to form the centre of information and advice if they exclude women from their membership. One consolation, indeed, women are offered by the administration of the Automobile Club. That is, they are classified with minors—not infants—

therefore a woman now can surely claim equality with youths who have lived twenty years and eleven months, and even a score more days.

Women may be very weak and silly creatures, but they represent at least half, if not more, of the human race. True; the gentlemen members are most kind and considerate in taking women for drives like children in their motor vehicles, but it is an odd mixture indeed to have, on the one hand a club, which has been founded to be a centre of information, and, on the other, a rigid rule for the exclusion of adults in consequence of the sex disability. To make the situation perfectly logical, the trade should refuse to sell vehicles to "ladies and minors," as being only fit for the use of gentlemen. Yet I have read, continually, advertisements—indeed, it was precisely a press notice that led me first to the study of motor-vehicles—declaring that certain cars are so simple that any lady can drive them. When first the suggestion of the formation of a Ladies' Automobile Club was mooted, women were accused of desiring to intrude upon the privacy of men enjoying the comforts of their own club, but seeing that this was false, and that we only desired to form a very unpretentious centre for the study of motor-vehicles, it has been asserted that not enough women interested in automobilism exists. I put the challenge here! Are we, or are we not interested?

If we are, let us start from a centre, and study all that pertains to automobiles and automobilism and see where we stand. The sooner a start is made the better it will be for all concerned, for this is a question that affects the interests of the entire human race.

STORAGE BATTERIES FOR CANAL-BOATS

At a meeting of the Executive Committee of the Erie Canal Electric Traction Company, held recently, it was decided to adopt for use on canals, including the Erie Canal, the storage-battery motor, subject to the approval of the New York State Superintendent of Public Works. These motors are put out by the Electric Vehicle Company, of Hartford, Conn., and the Electric Storage Battery Company, of Philadelphia. These organizations are controlled, it is understood, by the Widener-Elkins-Dolan-Whitney Syndicate, which control all patents, both foreign and domestic, covering storage battery and motors and devices. It is stated that contracts for canal-boat storage batteries were let involving more than $1,000,000.

The Houpied Igniter

By Paul Sarrey

THE electrical apparatus employed in most hydrocarbon motors for discharging the explosive mixture of gas and air comprises a primary or accumulator battery, an induction coil and a vibrating armature whereby sparks of sufficient heat are produced to insure regular explosions within the cylinder.

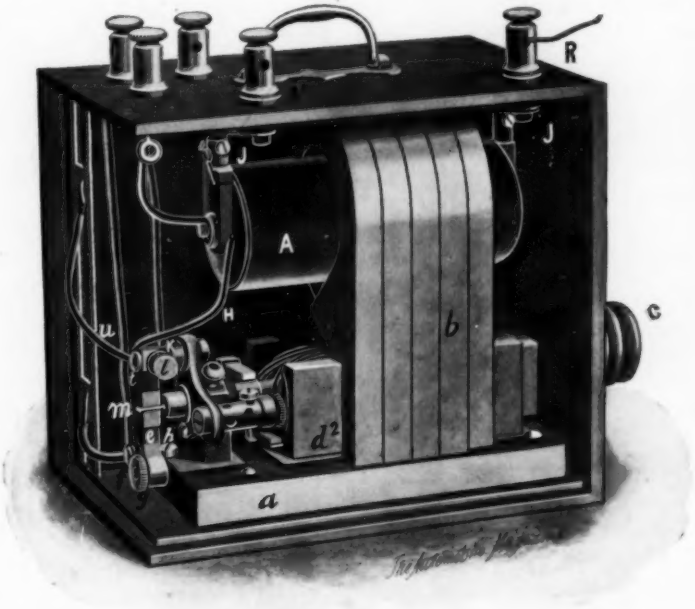


Fig. 1

But the care required by primary cells and accumulator batteries has caused many a *chauffeur* to turn to the magneto-electric machine. Among the electric ignition devices which employ such magneto-electric machines may be mentioned the Houpied igniter, which forms the subject of the accompanying illustrations.

All the parts of the Houpied apparatus are inclosed in a wooden box Z of such small size that it can be readily carried from place to place. For greater convenience the induction coil A and the condenser C can be arranged in a second box on the automobile. Between the poles M^1 M^2 of the magnet p turn the poles S S of a Siemens armature mounted on the shaft X provided at its end with a pulley which receives power from the motor by a strap or belt. The current produced by the rotation of the armature is rendered constant in the usual manner by means of brushes B^1 B^2 connected with a split-ring collector D.

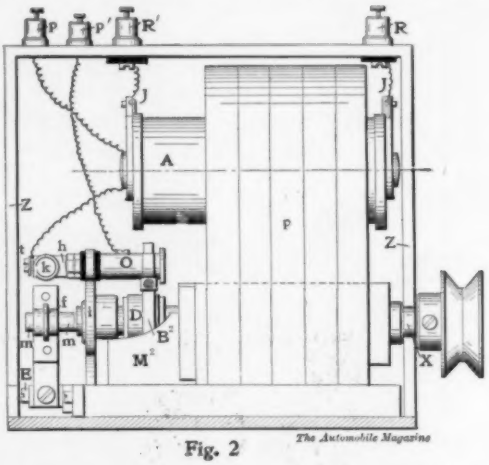


Fig. 2

Fig. 4 is an end elevation, showing the interrupter in its circuit-breaking position; in which position a current is induced in the fine wire of the induction coil A. Two vertical, parallel springs e e^1 mounted on a strip of copper, are held on the cam m and are joined by a crosspiece. The contact at the end of the spring e of the interrupter is composed of a small piece g of platinum. The spring e^1 is provided with a wheel f, turned on its axis by frictional engagement with the cam m. Connected with the brush support i is a binding post, through which passes a screw K, the point of which is adapted to engage the platinum contact g of the spring e. When the platinum g and the screw point g^1 are in contact, the circuit is completed; when the platinum and screw point are out of contact, as shown in Fig. 4, the cur-

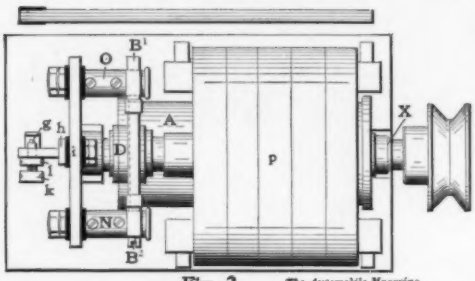


Fig. 3

rent is interrupted. The spring e carrying the contact g is thus caused to make and break the circuit by the rotation of the cam m extended from the shaft X.

One end of the secondary winding of the coil A is secured to the binding post h by a screw t; and the other end is connected with the binding post B on the exterior of the box. The binding post B, furthermore, constitutes one of the terminals of the primary coil, the other terminal being connected with the binding post p^1 and with the brush support N. The interrupter forms part of this circuit. Since the speed of most motors varies considerably, some means must be provided for regulating the length of the spark and the frequency with which it passes between the terminals. For this reason a rheostat is generally employed.

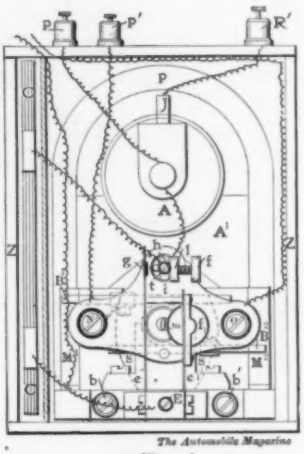


Fig. 4

When the pulley on the end of the shaft X is turned, the armature will induce a current as it rotates between the poles M^1 and M^2. This current is collected by the brushes and conducted by the connecting wires. Whenever the cam forces the contact g into engagement with the point g^1 of the screw K, the circuit is completed; whenever the points g and g^1 are out of contact the current is interrupted. The circuit is broken twice in a single revolution of the shaft X; hence there are produced a number of induced currents which cause as many sparks to pass between the terminals of the wires running from the binding posts R and R^1.

It will be observed that in the figures the induction coil A is placed within the magnet p of the magneto-electric machine, in order to reduce the size of the apparatus. When thus arranged the coil is necessarily incased within an insulating envelope and mounted on an insulating support.

The New Sport Abroad

(By Our Own Correspondent)

PREPARATIONS for an adequate representation of automobile interests at our great Exposition are well in hand, and the programme thus far developed gives assurance that this department will constitute one of the most absorbingly attractive features of the occasion. The Automobile Club of France has very appropriately been given practical charge of the matter by the committee on the Automobile Section. One of the important attractions will be the long-distance races to be held throughout the Exposition. They will be so arranged that, instead of taking place between Paris and Bordeaux or Paris and Hâvre, as has always been the case hitherto, the long course will cover a route which, while it will be several hundred kilometres in length, will have a trefoil shape, and therefore will be kept within easy reach of Vincennes, where the Automobile Department will have its headquarters, so far as practical demonstrations are concerned. This innovation for the long-distance contests will be advantageous both to the racers and the public in various ways. Those desiring to witness a race in its progress and under any of the various conditions that prevail according to the character of this or that portion of the route will not have to go far from Paris to reach any part thereof. And many will naturally give themselves the pleasure of going to the scene by automobile conveyance. The nearness of all parts of the route to headquarters will also give the advantage of keeping the public constantly informed as to the progress of a race, which will be recorded at Vincennes upon little electric tables representing the route in miniature, with the automobiles of the contestants shown in small models. In this way the race can be accurately

A Parisian Chauffeuse

Two Up-to-Date Automobilistes

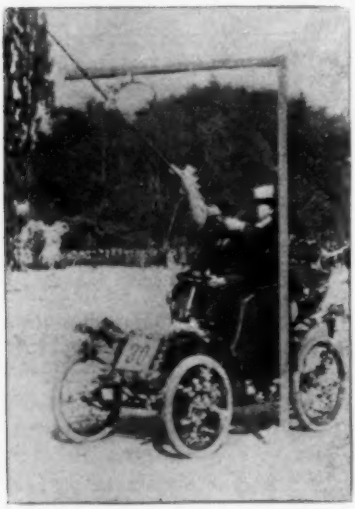
followed throughout in a manner similar to that in which baseball games are represented in America.

A special track and grand stands will be constructed at Vincennes at a cost of 100,000 francs, and special prizes will be offered in addition to the regular Exposition awards. It is promised that some of the contests will be of a unique character. For electric automobiles a charging station will be established close to the track. Particular attention will be given to providing opportunities for testing automobiles of various kinds, and intending purchasers will be furnished facilities for making attractive little excursions, and thereby gain an idea of the qualities of the make which they desire to try. We understand that American manufacturers will make a particularly attractive showing in this department. For the contests the competing vehicles are to be divided into four classes: Heavy vehicles of various kinds, cabs, victorias and voiturettes—the latter including motocycles, tricycles and bicycles.

Automobile fêtes will be a great feature at Vincennes. The charm of this form of entertainment was made evident in the foretaste we had in the great fête held in the Bois de Boulogne very

recently—an affair full of interest—all the vehicles participating decorated with flowers, and many of them splendidly decked out at great cost; the whole affair full of life and movement, fun, gaiety and excitement from beginning to end. A practice ground was established at the Longchamps track, covered with all sorts of stuffed lay figures and other obstacles, through which the automobilists had to thread their way. There was also a contrivance so arranged that in passing they were expected to carry away at the point of a lance little wreaths of flowers hung there. Above some of these wreaths buckets were balanced, the merest touch upsetting them and deluging the passer with confetti. Some of the automobilists were boys and girls, and the skill which they showed was often marvelous. A little fellow of nine years wound his way successfully at the highest speed by the most intricate course past every obstacle. Most of this young-folks' work was done on motocycles and the like, but there was one young lady of sixteen, Mlle. Richards, who ran a large automobile with extraordinary facility. There was a quadrille, beautifully wheeled by eight victorias, and at the end there was a graceful farandole, with all the vehicles present—something like seventy in number—twisting their way in single file around the track.

One of the features of these fêtes, most interesting to ladies, were the latest automobile fashions displayed by some of the fair contestants. Most of the gowns then worn showed the brilliant maroon or crimson known among women's tailors and modistes as "automobile red."



Ring Sticking Contest

Now that the cool weather of autumn and early winter has set in, a new-fangled Pelisse, worn exclusively by automobilistes, has come into fashion. This cloak, which resembles the overcoats of fashionable coachmen, is trimmed with fur, preferably of brown or gray, when worn with a waterfall cape. The cloaks that have no cape are long and close fitting, and are covered with fur from the top to the bottom, giving a decidedly arctic appearance to their wearers.

The New Sport Abroad

We have all been laughing at a comical occurrence in which the well-known Bordeaux automobilist, M. Lanneluc-Sanson, took leading part. He might well have fancied himself Don Quixote and his automobile a *fin de siècle* Rosinante, gallantly coming to the rescue of a fair dame fallen into great danger. On his way back from a service of twenty-eight days as *chauffeur* to the commanding general of the Eighteenth Army Corps, he reached the village of Mèrignac, in Gironde, at nightfall. There he found the whole place in commotion. People were running about. Inquiring as to the cause of the excitement he learned that a cow had fallen into a well. Repairing to the spot he found a crowd of peasants at their wits' ends, vainly trying to hoist the cow out with a rope. But the cow was heavy and the poor creature bellowed and groaned in vain. A brilliant inspiration seized M. Lanneluc-Sanson. He attached her halter rope to his auto, mounted his machine and started ahead. The rope grew taut and under the weight at the other end the automobile almost came to a stop. But gradually it went ahead, coughing mightily with the exertion. A great shout of joy arose from the assembled peasants. The cow's head came peering above the rim of the well and she was landed securely at the surface.

Confetti Dropping

In Brittany there has been an interesting conversion. A good priest, the curé of a hamlet, had conceived a most profound hatred for the new invention, and when automobiles went by he would mutter maledictions upon them, cursing them as instruments of the devil, imaginings of hell, devices of heretics! When he encountered one on the road he would cross himself, and in the odor of petroleum wafted therefrom he would fancy he detected the sulphurous vapors of the infernal regions—and to tell the truth it may be doubted if the latter smell any worse than certain " petrolettes " I have in mind.

Time went on, and one evening the good father was called upon to administer the last sacrament to a dying man two leagues away in the country. It was cold and blustering; the raw wind

carried driving rain. The curé shuddered as he thought of the long walk before him, the wet blast in his face.

Just then an automobile drew up at his door. "Pardon, Monsieur le curé," called the occupant; "the route to Saint-Gothbert, I pray you."

Saint-Gothbert! The very hamlet where the dying man was awaiting his ministrations! The priest hesitated a moment, but his desire proved stronger than his repugnance, and he replied: "Will you allow me, monsieur, to show you the road? Is there room for me beside you?"

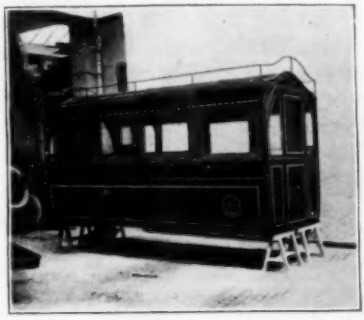
Automobile Pelisse

Twenty minutes later the good curé was anointing with the holy oil the dying one, who soon sank into the dreamless sleep.

Now, when the worthy father is asked what he thinks of the automobile he will make answer: "Ah, monsieur, an invention blessed of the Lord!" And he will tell the story of that stormy evening.

Of course the experiment of the Post-office in the collection of letters by automobile is successful. The results show an average gain of forty-five minutes over the time taken in collections in the

old way, on foot. A remarkable application of the automobile to postal work has been arranged for the French Soudan, whither a 9 horse-power Dietrich vehicle has just been forwarded for the purpose. The automobile, very naturally, is particularly adapted to the requirements of a level desert country, where the dryness makes good roads an easy possibility. A new colony, like a new house, has the advantage of the latest modern improvements in its first organization. In the heart of Africa I am told that it is no uncommon spectacle to see stark naked negroes dashing around on bicycles, and it would seem that in the Soudan our colored brother is to obtain one of his first lessons in civilization through experience with the automobile.



Body of Partinium Automobile

Among the most curious innovations in the manufacture of automobiles are two newly invented vehicles of French make. One derives its driving power from acetylene, a substance hitherto not used for automobile motors. The other vehicle is intended for a delivery wagon, of unusually light construction, since most of its metal parts and the body of the wagon as well are fashioned of partinium, a newly discovered metallic alloy of aluminum and tungsten.

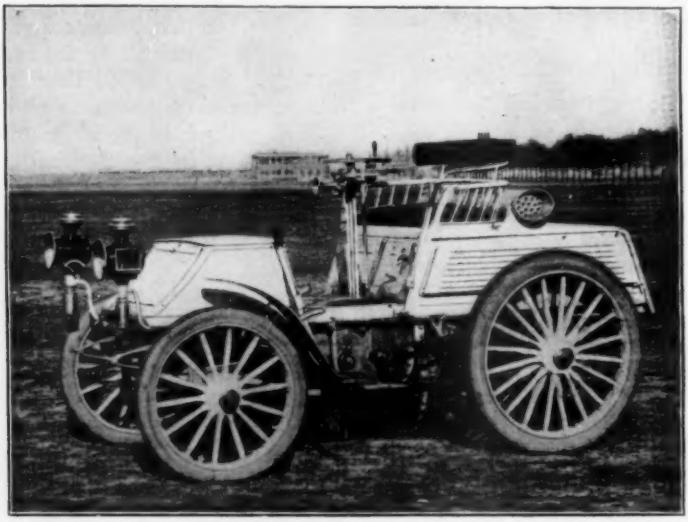
French Postal Motor

There is beginning to be some uneasiness over the advancing price of gasoline. It has recently gone up 5 centimes a litre. The price in Paris is now 65 centimes a litre—15 centimes more than we have to pay outside the gates, all on account of the octroi.

The Automobile Magazine

The Automobile Club has advanced its entrance fee to 200 francs with the first of the new year. The membership of the club is now but little short of 2,000. The club has recently honored M. Forestier with a bronze medal in token of his services in organizing the club competitions, and it has also awarded to M. Georges Prade of the Vélo a medal and a diploma as a souvenir of the race between Paris and Ostend.

The work of record-breaking continues. Béconnais, riding a Phébus tricycle, recently surpassed existing records for the hour by the following figures: 10 kilometres in 8m. 41s.; 20 kilometres in 17m. 19⅘s.; 30 kilometres in 26m. 3⅕s.; 40 kilometres in



German Prize Racer

34m. 55s.; 50 kilometres in 43m. 48⅗s.; 60 kilometres in 52m. 49⅘s. And in an hour he ran 67.901 kilometres.

In Germany the following awards were made for the long-distance race of 185 kilometres from Berlin to Leipsic in connection with the recent International Automobile Exhibition in the former city: Motor carriage group—First prize of gold medal, with prize of honor in shape of a portrait of the German Emperor, to Benz & Co., of Mannheim; second prize of gold medal, with prize of honor in shape of a portrait of the King of Saxony, to Dietrich & Co., of Niederbronn; third prize of silver medal, with prize of honor in shape of a portrait of the Secretary of State

von Podbielski, Honorary President of the Exhibition, to Baron von Liebig, of Reichenberg, in Bohemia.

The new Deutscher Automobile Club of Berlin has for its patroness Her Imperial Highness the Grand Duchess Anastasia of Mecklenburg-Schwerin. The Grand Duchess is an enthusiastic automobiliste and has several motor-vehicles of various descriptions at her hunting castle of Gelbensand near Rostock. The Grand Duchess, with the Grand Duke, was one of the earliest visitors to the automobile exhibition, and the distinguished pair took a keen interest in the affair.

From Australia come some particulars about the largest automobile in the world, which the owner, a wealthy Queensland miner, has appropriately named the "Goliath." It is run by a petroleum motor of 75 horse-power. Its weight is 14 tons and it has a carrying capacity of about 50 tons, going at the rate of 13 kilometres an hour when loaded. The owner is the proprietor of a gold mine that lies about 600 kilometres in the interior, and the huge affair was designed to carry freight to and from the mine. Its cost was about 40,000 francs.

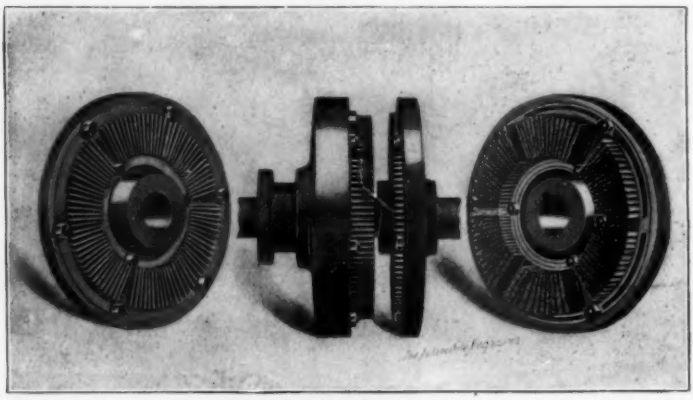
Grand Duchess Anastasia of Meklenburg-Schwerin

Chief Patroness of the German Automobile Club

Syner's Elastic Clutch

THE elastic clutch, invented by the Belgian engineer Snyers, consists of two disks, one of which is formed with radial grooves, and the other of which is provided with brushes composed of tempered steel wires. Our central illustration shows the two disks mounted face to face. When the two disks are thrown into engagement, the brushes enter the grooves, press against their walls, and bend slightly; the force exerted is equal to the total flexive effort of the tempered steel wires on the corresponding grooves. In order to engage or disengage the two disks, but a slight effort is required.

Whatever may be the speed of rotation of the shaft the clutch can be thrown into gear gradually and without any shock. When the disks are in engagement with each other, there is no



Elastic Clutches

danger of the parts' slipping, so long as the power transmitted is not greater than that which the clutch is capable of transmitting. The disks are instantly disengaged when the transmission-gear sustains a shock or when the power to be transmitted becomes excessive.

These results are not obtained by friction, as in most similar devices. The wear is reduced to a minimum. The clutch is capable of standing hard usage, and will operate effectively after continued service without the need of repeated inspection or repairs.

The clutch has been applied with considerable success to several Panhard-Levassor carriages.

William Rogers, C. E.

The Electric Automobile

By Prof. Félicien Michotte

(Continued from The Automobile Magazine for November)

THE DISCHARGING OF A BATTERY

ACCUMULATORS may be considered discharged when the voltage is less than 1.9 per element, *i.e.*, when it is less than the number of elements multiplied by 1.9. For 40 elements we should therefore have

$$40 \times 1.9 = 76 \text{ volts.}$$

The discharge can be forced beyond this voltage, but at the risk of deterioration to the battery. Beyond 1.8 volts the discharge should never be pushed, for then deterioration will certainly set in.

A battery of accumulators, even when not in use, will gradually be discharged. It should therefore cause no astonishment if, at the end of three days, the cells should yield no current.

Electric carriages can be divided into two classes: (1) Vehicles with fore-carriages (*avant-train moteurs*), and (2) rear-driven vehicles.

Vehicles with Fore-carriages.—When electric vehicles were first introduced, it seemed as if the fore-carriage system were the only one applicable to electric automobiles. The carriage was pulled instead of being pushed; and the small size of the electric motor apparently simplified the solution of the problem. But if the motor be easily disposed of, there still remains the difficulty of adequately transmitting the power to the wheels. Jeantaud, who first employed the system, has since discarded it. In order to overcome the difficulty, Messrs. Krieger and Doré have devised two methods.

Krieger mounts a motor at each wheel; and each motor transmits its power directly to the wheel by means of a small bronze pinion. This system has the advantage of employing two motors. If one motor give out, the carriage can perhaps still be driven by the other. On the other hand, the two motors and the very large and complex switch required, increase the cost of the carriage considerably.

In the Doré carriage the motor is mounted in front of the driver's box; and power is transmitted to the front axle by a

vertical shaft provided with pinions which drive a differential gear on the front axle.

Rear-driven Carriages.—Rear-driven carriages are most numerous; and their transmission-gear is similar to that of petroleum automobiles. The motor drives a shaft carrying the differential gear and having at each end a sprocket-wheel connected by a chain with another sprocket on the carriage-wheel. The use of the double chain-gear has the disadvantage of consuming considerable current owing to the unequal tension of the two chains.

ELECTRIC BRAKING—RECUPERATION

When the carriage is running on a down-grade, the current can be shut off and the carriage run by its own momentum. The motor, however, continues to turn, owing to its connection with the wheels. But, instead of transmitting power, it receives power from the wheels; and the armature, turning between the electromagnets in the contrary direction, generates a current. The generation of this current offers resistance to the rotation of the armature, which resistance is transmitted to the wheels by the transmission-gear and opposes their movement. The current produced can be conducted to the accumulators, and hence a certain quantity of electricity is stored up. What has been lost is therefore partially recuperated. The electric brake is useful and efficient, but the current produced is so feeble that there is but little to be gained by conducting it to the battery.

CHARGING-STATIONS

Carriage batteries can be charged:

1. By dynamo.
2. On lighting-circuits.

By Dynamo.—The dynamo can be driven by any motor whatever—hydraulic, steam, gas, or petroleum. The power of the dynamo should be proportional to the number of carriages to be charged. Direct-current dynamos are well adapted for the purposes of a charging-station. The voltage of the dynamo must be greater than that of the accumulators to be charged; the ampèrage should be equal or lower than that of the battery; if it be higher, it can be reduced by means of resistance-coils.

On Lighting-Circuits.—In cities, where there is a general circuit, part of the current can be shunted to the battery, if its tension be not greater than 100 to 110 volts. If the tension be higher, the usual resistance-coils can be resorted to.

COST OF A STATION

A charging-station is far from being costly. An oxid battery can be charged by a dynamo of fifteen ampères, and a Planté battery by one of thirty to forty ampères. A switch-board, with the necessary instruments, costs but little more than $40 (200 fr.) in France.

The cost of charging by using electric-light circuits varies with the length of the feed-wire. Some companies charge exorbitant prices.

THE CARE OF AN AUTOMOBILE

The care to be given to an electric carriage is confined chiefly to the motor, accumulators, and co-acting mechanism.

Motor.—In running a motor or dynamo, the wear of the brushes should be noted, the collector and connections kept in order, and sparking prevented.

If a wire of the collector be defective, it should be immediately repaired; otherwise the motor will surely be injured. The bearings should be well lubricated.

Accumulators. — The accumulators should be frequently tested for short circuits and dead cells.

If it be observed that the voltage of a charged battery be below the normal, each cell-couple should be separately tested. If the voltage of one be lower than the normal, then in this particular group defective cells will be found.

The elements of the cells should be tested by a low-reading voltmeter (capacity, 3 volts). Cut out all inactive cells; examine the connections frequently and keep them in order; see to it that the insulation of the retaining-case is perfect. Keep the electrolyte up to the standard strength, either by the addition of water or acid.

In repairing defective connections, care should be taken to arrange the wires exactly as they were originally. It is advisable to prepare a diagram of the wiring for purposes of verification.

If the plates become coated with sulphate, the battery should be sent to the manufacturer to be restored to its former active condition.

Mechanism.—The care of the mechanism of an electric automobile is exactly similar to that of a petroleum-motor carriage.

TOOLS TO BE CARRIED

A special wrench for the wheels.
A monkey-wrench.
One pair of pincers.
One pair of cutting-nippers.
Wire; insulating material for defective connections.
Lubricating-oil for the motor.
Emery-cloth.
Extra brushes and coil-springs.
Rags.

At the charging-station, acid (20°), pure water, a Beaumé aërometer, and one or two plates should be kept.

DISTANCE COVERED BY AN ELECTROMOBILE

The distance which a carriage can cover is limited by the capacity of its accumulators and the efficiency of its motor. The former is the more important; for the capacity varies with the system and with the weight of each element.

Experience has shown that a weight of 10 to 12 kilos per element, or a total weight of 690 to 780 kilos, gives the best results.

With a Planté battery weighing 780 kilos, a carriage can cover 60 to 65 kilometres with a good driver, and 50 to 55 kilometres with an ordinary driver. The former knows how to utilize his current better than the other. Hence the difference.

Distances of 100, 150, and 180 kilometres are said to have been covered; soon we shall hear of runs of 200 kilometres. These are but harmless pleasantries, and their authors have probably never ridden in an electric carriage.

HOW TO RUN A CARRIAGE

An electric carriage can be more readily controlled than any other vehicle. The driver merely manipulates a number of levers and need take no especial precautions in starting or stopping.

In the petroleum or steam carriage, the question of fuel does not disturb the *chauffeur;* for he can readily replenish his supply whenever it may be necessary. But the driver of an electric automobile is hampered by the limited capacity of his battery.

When his power gives out he must seek a source of electricity and lose considerable time in recharging. For this reason he must learn how to utilize his current to the utmost profit—a matter which is simple enough, but which requires a little study. He should keep an eye on the road before him, increasing his speed on an up-grade, shutting off the current on a down-grade, stopping his carriage by allowing the motor to run down, and not by means of the brake, and avoiding all unnecessary, excessive discharges. By handling his current and motor thus judiciously he can add ten kilometres to the distance which his carriage can normally cover.

These rules—increasing the speed on an up-grade, shutting off the current on a down-grade, and allowing the carriage to travel by its own momentum—are simple enough, and are easily learned and applied. In coming to a stop, shut off the current at the proper time, and allow the motor to run down of its own accord; use the brake only when the momentum acquired will carry the vehicle too far.

Hill Tests

The most important point on which the purchaser of an automobile should be satisfied is the hill-climbing power of the motor vehicle submitted to him. Only not is it necessary that the carriage should take its full load up a steep hill, but it is essential for satisfactory touring that a steep hill should be taken at a good speed.

Many automobiles are so under-powered (that is, the weight of the carriage body and load is too great for the power of the motor) that on a hill of any steepness they cannot pull their load at a speed of more than four miles an hour.

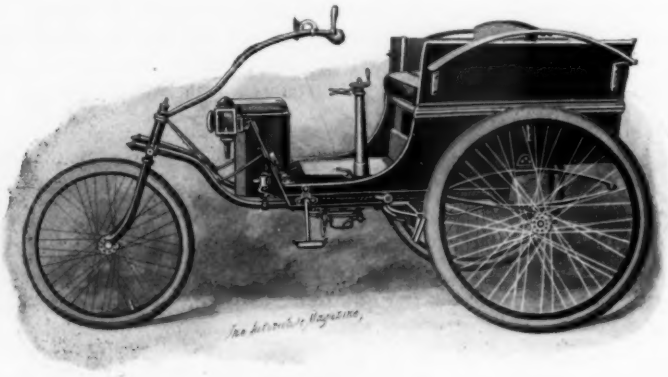
If one of these carriages mount a hill of steep grade at four miles an hour and descends it even at the high speed of thirty miles an hour, its average for the two miles would be, in spite of the illegal and break-neck rush down-hill, only a shade over seven miles per hour.

If a buyer finds that the motor he is inspecting has not been submitted to the Automobile Club test, he should insist on the seller's carrying out a hill-climbing test in his presence.

A purchaser should, after the hill test, take the time over a mile on the flat, to see that the car as geared for hill-climbing will also make good time on the level.

Steam Carriages of the Société Européenne d'Automobiles

EVERYONE who visited the *Salon du Cycle et de l'Automobile* remarked the steam tricycle-cart exhibited by the *Société Européenne d'Automobiles*. This little automobile attracted attention not only because of its light appearance, but also because of its simple motor—a steam-engine of novel construction patented by Messrs. Tatin and Tanière.

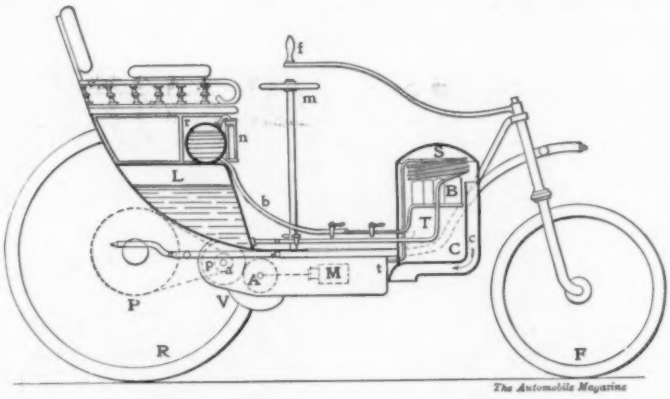


Steam Tricycle Cart

In our sectional and plan views of the carriage, *r* is a cylindrical petroleum-reservoir located beneath the seat. By means of an air-pump *n*, the pressure within the reservoir is so regulated that, upon opening the proper cocks, the hydrocarbon will flow through the tube *b* to the Bunsen burner B, mounted beneath the coil S, which constitutes the steam-generating portion of the boiler C. The boiler, in addition to its small size, possesses the merit of generating steam in an exceedingly short time. The water contained in the reservoir L is fed to the boiler by a pump, the quantity supplied regulating the speed of the motor M, driven by the steam generated in the coil S and conducted by the tube or pipe *t*. The products of combustion escape beneath the carriage through the passage *c*.

The motor M is a single-cylinder, double-acting engine, the

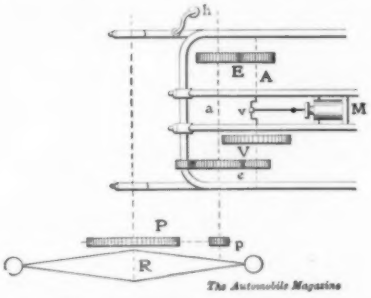
piston-rod of which drives the crank *v* and hence the shaft A, carrying the fly-wheel V. At both ends, the motor-shaft is provided with gear-wheels E*e*, each of which is operatively con-



Sectional View of Steam Tricycle Cart

nected with a carriage-wheel R, through the medium of a pinion *p*, connected by a chain with the sprocket-wheel P.

The arrangement is evidently extremely simple, and is all the more noteworthy because the usual differential-gear has been discarded. But a single wheel is driven at a time. Hence there are two changes of speed, the one being obtained by the large

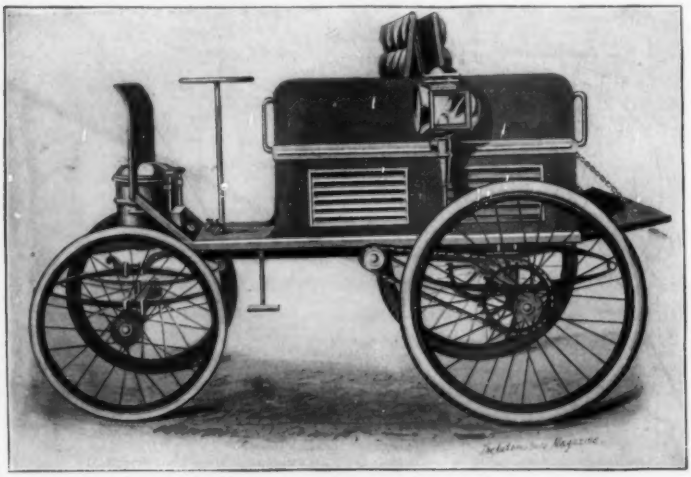


Plan of Steam Tricycle Cart

gear-wheel E, and the other by the small gear-wheel *e*. The motor is thrown into gear by means of the hand-wheel *m*; and steering is effected by means of the handle-bar *f*, controlling the

small front wheel F. The brakes are operated by means of the pedal *h*. The motor can be readily reversed so as to drive the carriage backwards.

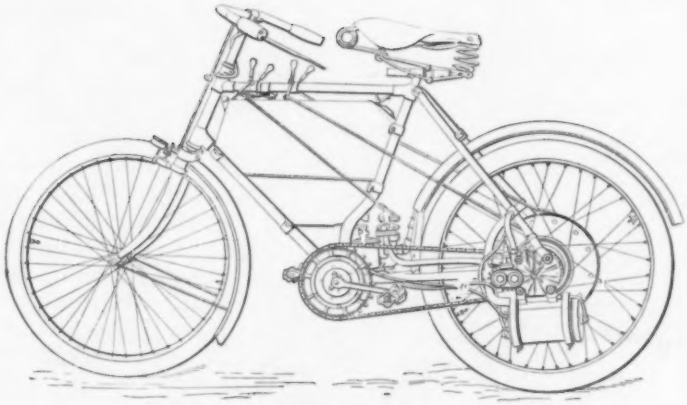
The carriage is in every respect equal to the petroleum-motor *voiturette*, and is more easily operated and controlled. By in-



creasing the amount of water fed to the boilers and the quantity of petroleum supplied to the burners, the speed can be increased. The carriage can easily be driven at a rate of sixteen miles per hour. The water and petroleum reservoirs have a capacity sufficient to enable the carriage to run five hours.

THE AWAKENING OF RUSSIA.

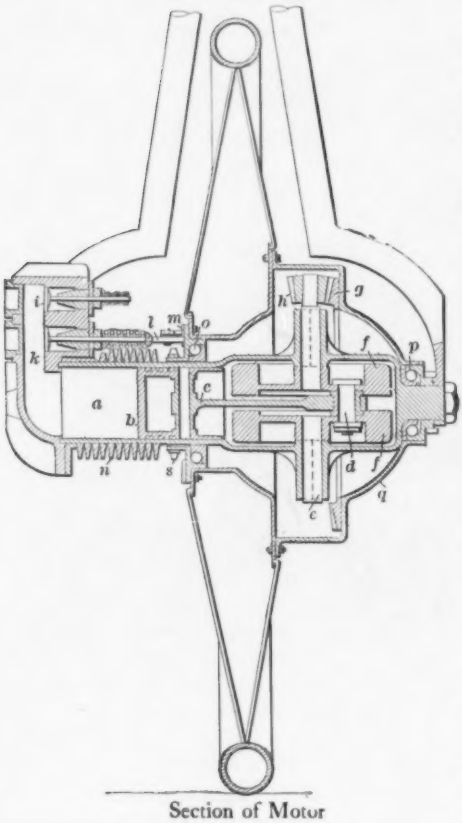
Automobiles have now obtained official recognition in St. Petersburg. So far only twenty-one permits have been issued for travelling by autocar through the streets of the capital. The rules which automobilists must observe have been drawn up and only await the sanction of the Duma, or Municipal Council. Before the permits are granted the *chauffeurs* have to pass an examination and their vehicle is carefully inspected. They must go at a speed of not over twelve versts (about eight miles) an hour, without causing any smoke or steam.



The Butikofer Motocycle

The Butikofer Motocycle

AUTOMOBILES have now been in use for several years, but so far as external appearance is concerned, little improvement has been made over the first types introduced. The public cabs which go winding in and out among the wagons and cars that crowd our business-streets, seem to have been built upon the lines of a steam-roller; their huge tires, their clumsy wheels, their low tops, have often enough offended the eyes of those accustomed to the slower, but more graceful horse-drawn hansoms. In motocycles the awkwardness of appearance is even more apparent and is largely due to the attempt to bring two radically different elements into harmony. A motor is one thing, a bicycle a totally different thing. And the attempt to apply the one to the other without some changes in design, must necessarily produce a combination which, esthetically, leaves much to be desired. A glance at one of the more recent types of motocycles, of which we present illustrations, will prove that decided changes in design must be made before the motor can be successfully applied to the bicycle. But, whatever may be the faults of existing motocycles, it cannot be denied that considerable ingenuity has been displayed in their details. As a typical motocycle we have selected a Butikofer vehicle, in which both the faults and the merits mentioned may be found.



Section of Motor

In our sectional view of the Butikofer motor, the cylinder is represented by *a*, the piston by *b*, the piston-rod by *c*, the crank by *d*, and the fly-wheel by *f*. At the end of the motor-shaft *e* is a bevel-gear *h*, engaging a second bevel-gear *g*, secured to the casing *q*, forming part of the bicycle-wheel hub mounted in ball-bearings *o*, *p*. The sprocket-wheel *s* is chain-connected in the usual manner with the pedal-sprocket, and is provided with four symmetrically-disposed cams, by which the exhaust-valve *k* is operated. Any form of ignition device can be used. The remaining details of construction require no explanation.

STEERING-GEAR

The steering-gear is of vital importance. The point is not whether the car be guided by a tiller or a wheel, for a tiller may govern an admirable gear and a wheel may control a dangerous form of transmission of direction. A steering-gear, to be safe, must be such that the steering-wheels are not deflected by accidental causes, such as stones in the road. The worm-gear used in French racing cars has proved to be very safe and efficient.

Ernst Petroleum-Motor Carriage

ONE of the most attractive carriages exhibited at the *Exposition Internationale des Tuileries* was a *voiturette* made by Ernst et Cie., which was noteworthy both for its handsome appearance and for the novelty of its mechanism.

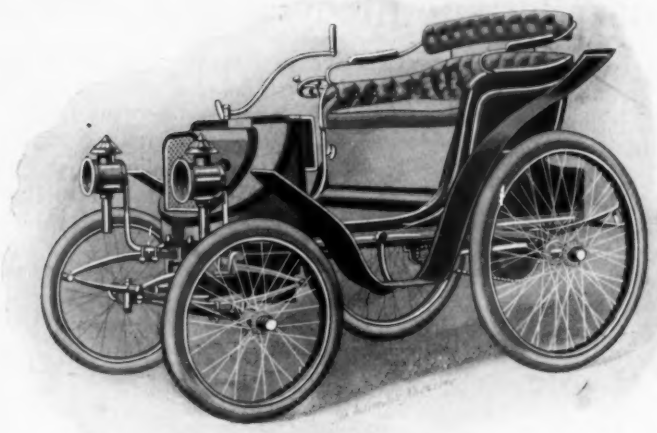
The *voiturette*, as our illustration shows, is a light, graceful, two-seated vehicle, which, although it weighs not quite three hundred pounds, is nevertheless remarkable for the durability of its construction.

Ernst Voiturette

The motor used develops 2¼ horse-power, and is enclosed in a casing mounted in the rear of the carriage, and so disposed that the carriage loses nothing in appearance. So perfect is the operation of this motor and its carbureter, that no odors whatever are given off. The carriage can be started gradually, and can be driven up fairly steep grades at a good speed. Two changes of speed are provided.

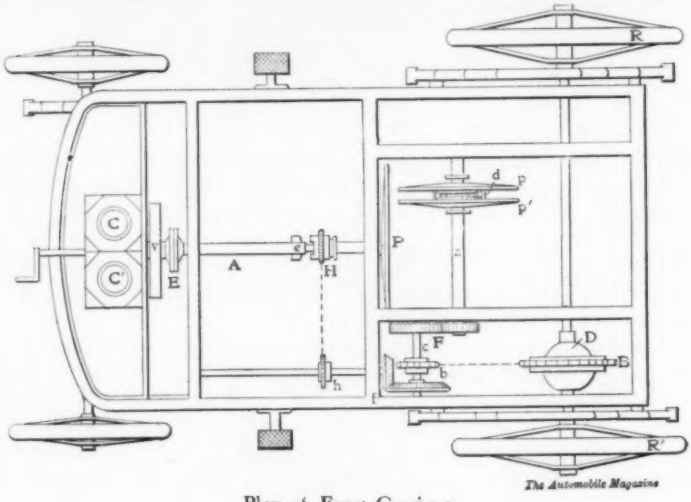
In the Ernst three-seated carriage, which we illustrate in perspective and plan, a four horse-power motor is used, having two vertical cylinders, CC′. The motor is mounted in the forward portion of the carriage and, through the medium of a friction-clutch, E, turns a longitudinally-extending shaft, A, which drives a friction-wheel, P.

This friction-wheel forms part of a mechanism comprising



Ernst Carriage

two disks, *pp'*, rotating in a plane perpendicular to that of the friction-wheel, P, so that there will be two points of contact instead of one, thereby insuring the transmission of the movement of the wheel, P. The friction-disks, *pp'*, are so mounted on an auxiliary shaft, *a*, that by means of a shifting device they



Plan of Ernst Carriage

can be moved in order to vary the speed. This speed will depend upon the relative positions of the disks, *pp'*, and the friction-wheel, P. When the disks are in contact with the periphery of the wheel, the speed will be at its maximum; when the disks are in contact with the centre, the speed will be zero; and when the disks are shifted beyond the centre, the motion of the shaft, *a*, will be reversed. It is evident that by this ingenious arrangement of friction-disks and wheels the carriage can be driven backward without any shock or jar. Since the two disks, *pp'*, touch the wheel, P, at two different points, it follows that they are driven at different speeds. This inequality is compensated for by a small differential gear, *d*, mounted between the disks.

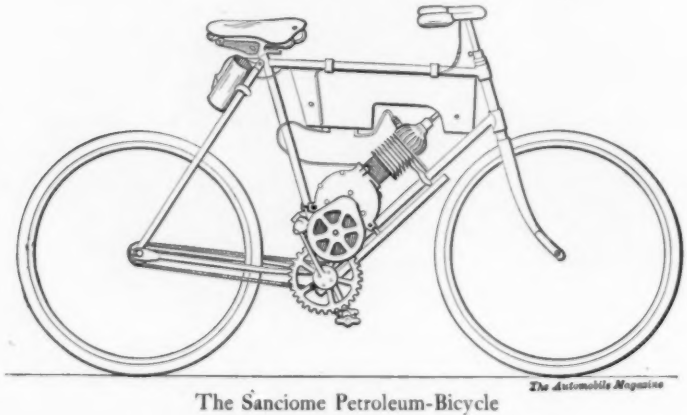
Ernst Hydrocarbon Tricycle

The movement of the shaft, *a*, is imparted to the shaft, *c*, at a reduced speed, by means of connecting gearing, F. A small sprocket-wheel, *b*, on the shaft, *c*, is connected by a chain with the sprocket, B, of the differential gear, D, mounted on the axle of the driving-wheels, RR'. The frictional engagement between the disks, *pp'*, and the wheel, P, may prove inadequate to drive the shaft, *c*. For this reason the shaft, A, has been provided with a clutch mechanism, *e*, whereby the shaft, *c*, can be directly driven through the medium of the bevel-gear, *f*, and chain, H*h*. In ascending a steep grade, the automobilist throws the clutch, *e*, into operative position, so that the motor will surely drive the carriage even though the friction-disks may slip. On level roads the disks and co-acting wheel, P, are used.

The Sanciome Petroleum-Bicycle

THE Sanciome petroleum-bicycle, of which we present an illustration herewith, comprises an extra light motor of four-cycle type, which develops about 1-horse-power and weighs not quite twenty-one pounds. The carbureter and ignition devices have been simplified in construction, for the purpose of saving weight and of rendering their control easy. The explosive mixture is electrically discharged either by primary batteries or accumulators, as in all motocycles.

The motor can be used on any bicycle and does not affect the stability of the wheel. It can be automatically thrown out of gear when the bicycle is running on a down grade. The shocks and jerks due to bad carburation have been avoided.



The Sanciome Petroleum-Bicycle

The bicycle, including the petroleum-supply and battery, weighs from sixty-one to sixty-six pounds, depending upon the size of the frame, and can cover twenty miles on a level road, and ascend grades of seven and eight per cent. without the aid of the pedals. No difficulty is experienced in steering.

The parts have all been constructed with a view to withstand long and hard usage, and are capable of being readily repaired whenever it may be necessary.

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Editorial Comment

THE Automobile Club of America has public sentiment very generally on its side in its endeavor to have New York's Central Park opened to the class of vehicles represented by its name—forcing the issue by the test case instituted by two of its members, who made a dash into the Park on an automobile and of course got arrested straightway by a Park policeman. The fact that the party was headed by Mr. Winslow E. Buzby, the banker, augurs well for the success of the effort, for it was Mr. Buzby who secured the opening of both Riverside Drive and Prospect Park to automobiles. There appears to be no good reason why an exception should be made of Central Park. It is doubtful, however, if anything can be accomplished merely by contending against the authority of the Park Commission to determine by rules and regulations the sort of vehicles that may be admitted to the pleasure grounds in their charge, however we may feel the injustice of a given restriction. For that matter appears to have been pretty thoroughly established under the bicycle agitation of years since, and it is just as well not to cherish any illusions. Public sentiment, however, triumphed then as it will triumph now. It would seem, however, that there is really no effective

regulation applying to automobiles in general in Central Park, if, as stated, the only authority for making the arrest lay in a clause of the Park regulations dating back to 1873, prohibiting the entrance of " steam engines, fire engines and heavy drays " into the Park. At the most that would hardly apply to anything more than steam automobiles. The aggressive action taken by the Automobile Club in the matter demonstrates the great value of such an organization, not only to the interests more immediately concerned, but to the community at large, through earnest and systematic promotion of one of the greatest instrumentalities of modern progress. The triumph of the Club in this contention is inevitable, as indicated by the irresistible advance of the bicycle in face of precisely similar obstacles. Therefore we may confidently look to see in the near future the parks everywhere freely opened to the automobile, subject only to such regulations as may be for the true interest of its users as well as those of the public at large.

The special automobile ordinance, however, which was simultaneously introduced in the Municipal Council of New York, is not likely to help matters materially, and in some respects it might prove a serious hindrance. Since there is no law against automobiles, as the court had already ruled, there was no more call for a special ordinance permitting their use than for one permitting pedestrians to walk on the sidewalk. Moreover the ordinance makes this permission contingent upon the conduct of a person driving an automobile, who is enjoined to come to a full stop at request of or signal from a driver of a vehicle drawn by a horse or horses, should the latter show signs of alarm. This provision is too vague. Experience with similar restrictions in England show that it puts it into the power of persons maliciously inclined or hostile to automobiles to cause most serious and unjustifiable annoyance to drivers of the latter by feigning that their horses are alarmed. In England, for instance, the police authorities of certain villages have instituted a systematic persecution of automobiles by sending out detectives with horses purposely refractory. Another objectionable feature of the proposed measure is its limitation of speed to eight miles an hour. While low for a maximum, for in the vast and all but deserted outlying parks of the suburbs it would forbid the taking advantage of conditions where the way is unimpeded and there is nothing to justify restriction to so low a rate.

Editorial

The Next Postal Reform

There is a most useful field for the automobile in the postal service, particularly in the expediting of collections and deliveries in cities and towns. In various other ways it has proven a most valuable adjunct to postal work in Germany and France. In Paris and other European cities there are late automobile collections for outgoing steamers. A similar convenience would be of much value in this country. The value of the automobile in collections has been demonstrated by experiments in Buffalo, Detroit and elsewhere. Postmaster Dorr, of Buffalo, is enthusiastic about the automobile, which, at a dinner given recently to the Postmaster General in Chicago, he made the special subject of a most interesting speech. He declared the automobile "a machine which will contribute more to the advancement of business and the pleasure of man than can now be estimated."

As to its capacity he said: "I am impressed with the idea that the automobile can do the work of six horses at the cost of keeping one. It may not always be possible, or advisable, to so arrange the work as to realize such a percentage of advantage, but if a locomotive can do the work of a thousand horses, and an electric car can do the work of fifty horses, I am willing to stand here and say that a good automobile can do the work of six horses at the same expense as the care and keeping of one good horse usually requires." His investigations as to forms of motive power led him to the opinion that for rural free delivery the gasoline is more fit, and the electric more satisfactory in city collection and transferring.

Mr. Dorr thus gave the result of his own experiments in collection:

"Last April was when first I began seriously to think of the applicability of automobiles to department work. First I consulted the superintendents of the city delivery division of the Buffalo Post-office. Well I remember the answer of Superintendent Leib after having suggested to him that boxes could be collected at the rate of one in two minutes. His answer was: 'You might collect two or three boxes at that rate if they were close together.' Well, this same Superintendent Leib surprised himself by collecting thirty boxes in thirty minutes in a run of four miles. I expect soon to be able to collect sixty boxes in sixty minutes, running a six-mile route. I hope the department will provide opportunities for automobile advancement in all branches of the service, and if expectations are fully realized, then the pneumatic tube will be face to face with a dangerous competitor."

The Automobile Magazine

An Up-to-Date Phantom

AN institution, as a rule, demands age before it can be expected to be the subject of romance, poetry, legends, mysteries and strange happenings. Take the aspect of phantoms, for instance! There are numerous accounts of phantom ships, phantom horsemen, phantom stage-coaches, etc., but not until pretty recently have phantom railway trains appeared on the scene, and we have not yet heard of any phantom wheelmen, well adapted as the silently flitting bicycle is to act a part in ghostly apparitions. But the automobile gives new testimony to its extraordinarily rapid development, to its phenomenal precocity for a freshly fledged creation of modern invention, by already becoming the subject of a mystery that has been puzzling many people. Possibly this exception of the automobile from the rule may be due to the fact that though the invention has only just now been made practicable in its application, its beginnings date back for more than a century, while the idea itself has so long been in the mind of men as to represent, perhaps, a prehistoric aspiration! However this may be, there comes from Boston—very appropriately, since that is the stronghold of the American Society for Psychical Research—an account of what would seem to be a veritable Automobile Flying Dutchman!

Like the most famous of phantom ships, whose legend inspired Wagner to compose his *Fliegender Holländer,* this mysterious motor-carriage has a habit of turning up at the most unexpected places, and never being found when looked for. Actually, it seems that several lawyers, together with numerous policemen, have been endeavoring to find this particular automobile for the past four or five months, but have never yet succeeded in getting hold of it, although it is repeatedly seen on the suburban roads, now in this place, now in that. It is described as of a low rakish type, driven by a gasoline motor, with seats for four persons, back to back, and sheltered by a light canopy. It is commonly seen just at dusk or soon after nightfall, running at a stealthy pace over some suburban road, and occupied by two muffled figures. It leaves a strong trail of very unpleasant sulphurous smell behind it; the odor lingers so long in the air, of a calm evening, that some persons who have chanced to encounter it several times have nicknamed it "The Flying Skunk." Inquiries have been made of all known automobile manufacturers, and they all say that they have made no vehicle of such a description. It is supposed that it must, therefore, have been made in some

small shop, perhaps by two mechanics, who go out evenings to experiment with it. Some there are who attribute its origin to the Evil One.

The reason why discussion is rife is that two ladies were out driving some months ago and in one of the suburbs encountered an automobile of that description, carrying two men. Their horse showed signs of fright, and they asked the men to stop and wait until they got by. Instead of stopping—according to the statement of the ladies—the men answered impertinently to the effect that women had no business to be out driving by themselves, and they kept on their way. In consequence the horse backed and the carriage went off an embankment, a smash-up ensued and the ladies were injured. The automobile kept on and its owners, or occupants, are now wanted in court, but the law has not been able to lay hands on them. Whether the non-success of the effort forms another testimonial to the traditional reputation of the average police, or to the extraordinary efficiency of the automobile as an instrumentality for eluding pursuit, can hardly be said as yet.

Unhappily, this incident indicates that the automobile may contribute a new variety to the Road-Hog species. The most numerous variety of the species was long found among drivers of horses—as many a wheelmen will testify—with the Carriage-Hog and the Wagon-Hog as sub-varieties. But of late years the Bicycle-Hog has become exceedingly numerous, and possibly is now in a large majority, making himself as obnoxious—and even a greater source of danger—to his fellow wheelmen, as to other frequenters of the road. Probably the evolution of the Automobile-Hog is to some extent inevitable, but the sentiment of automobilists in general will co-operate with the law to make him as rare an object as possible, and by wise regulation reduce his capacity for harm.

Automobile Licenses

In Europe every automobile and every automibilist is licensed as a measure of precaution. The vehicle is subjected to a careful examination by the proper official; and the safety of every part is ascertained before a license is granted. The automobilist must prove that he is capable of driving a motor-carriage and that he is thoroughly familiar with the working of the mechanism. Then, and not till then, does he receive permission to drive his carriage through the public thoroughfares.

A similar two-fold examination might be instituted in American cities. An automobile motor cannot successfully be operated by a novice in mechanics; its construction must first be thoroughly understood before an automobilist can hope to guide his carriage through the streets with safety.

A Plea for the Electromobile

It seems to be the fashion among automobile journals to sneer at the electric carriage, to cast slurs on its supposed incapability of making long tours, and to exaggerate its faults. The well-worn arguments of small accumulator-capacity, short runs, and necessity of recharging at frequent intervals have long outlived their usefulness. To be sure the electromobile has its faults; so has every motor-carriage. But that it is far from being the thing of shreds and patches which many of our contemporaries would have us believe, is proven by a few runs recently made in France with carriages driven by electricity.

The distance between Paris and Rouen is somewhat more than 84 miles. Nevertheless with a single charge of the accumulator-battery of his carriage, Comte de Chasseloup-Laubat covered the entire distance in seven hours and fifteen minutes—a performance which should in itself be sufficient to refute the objections made against the electromobile. At the *Criterium des voitures électriques* in Paris, the first electric-carriage race ever held, a Columbia vehicle again proved what the electromobile was capable of doing both in the way of speed and economy of power. Bouquet and Garcin, makers of the well-known B. G. S. electric carriages, made the round of all the towns in lower Normandy with a despatch and facility that caused many a skeptical Parisian *chauffeur* to open his eyes in astonishment.

With accumulator-batteries of still greater capacity than those used in the runs cited, we may hope for even better results. Let us not forget that it is but a very short time since Planté devised the first practicable method of storing up electrical energy, and that great improvements can still be made in the construction of accumulators for automobile traction. That the last word has not yet been spoken for the storage battery is demonstrated by the many patents granted each year for new forms of cells. Indeed, the French automobile press is even now commenting upon the possibilities of a new battery which, with its great capacity and comparatively small weight, will probably add new laurels to those already earned for electric traction by Chasseloup-Laubat, Bouquet, and Garcin.

Editorial

The electric motor, regarded as an ingenious toy a quarter of a century ago, has developed into one of the most perfect mechanical contrivances of its kind. And the storage-battery, the much-abused storage-battery, possesses many features which have ever proved attractive to those who appreciate its merits, whatever may be its faults.

The strength of the electromobile lies in its simplicity. To set the motor in operation is mere child's play. By means of a simple switch the carriage can be started, made to run at any desired speed, stopped, and propelled backwards—all without any noise, without any offensive odor, without any shock.

The electromobile has shown what it can do both within the limits of a city and in long-distance traveling. The sphere of its application can be still further broadened by the adoption of a certain standard for storage-batteries. By making cells of only one size so that all electric carriages would use like batteries, many of the present objections to the electromobile would disappear. If a certain uniformity were observed it would be possible for an automobilist to exchange his exhausted cells for new ones at almost any place, without being dependent upon the electric-light circuit of a large city. In these days when there is a general cry for simplicity in all forms of mechanical devices, it is not too much to hope that the storage-battery will be thus constructed; for the step is one which can only benefit electric traction.

Metal Wagon-Bodies for Automobiles

Despite the rapid strides made by the automobile industry in France and in other countries, the largest manufacturing-firm in Europe cannot produce more than about forty vehicles in a month. Often a vehicle must be ordered a year in advance; and the fortunate possessor of a new carriage is sometimes enabled to make a neat profit by selling his automobile to some *chauffeur* too impatient to wait until the manufacturer reaches his order. In France the cause for this unnecessary delay in filling orders is to be found in the lack of proper machinery and the difficulty of obtaining skilled labor.

In the United States the best automatic machinery in the world is made and the quality of the labor employed is above reproach. The most formidable obstacle with which American manufacturers are confronted is the great difficulty of obtaining wagon-bodies. The trucks and necessary motors are all ready; but wagon-bodies are so greatly in demand, that the American manufacturer is not much better off than his French *confrère*.

The question naturally arises: Is it necessary to use wooden bodies? Why not build automobiles entirely of metal? That the plan is feasible has been fully demonstrated by the partinium (an aluminum-tungsten alloy) omnibus recently made by De Dion et Bouton. Aluminum and its alloys enter considerably in automobile construction in Europe; and there is no apparent reason why their use should not be extended to the making of all-metal carriages. Besides the greater strength and durability secured by the employment of aluminium, there is also a considerable reduction in weight. The De Dion-Bouton omnibus already mentioned weighs less than 500 pounds, and nevertheless has a seating-capacity of twenty-six. The use of steel tubing for the same purpose has already been advocated in these pages.

An Expert's Opinion

Among those who have followed the development of the automobile in America it has for some time been known that Prof. Elihu Thomson has been giving much attention to the practical problems connected therewith. A few weeks ago he stated some of the conclusions which he had reached, in the course of an informal talk before a local club in the Boston seaside suburb of Swampscott, where he lives. Since Prof. Thomson is not only one of the greatest of living inventors and the chief consulting expert for the General Electric Company at its great Lynn works, but is perhaps the most eminent authority on physical science in this country, his views have a particular value for everybody interested in the movement. He pronounced the present situation a peculiar one, inasmuch as it involved an enormous demand for something not yet developed. This fact of the demand for a new invention arising so remarkably in anticipation of the supply was unlike anything else he knew of in the nineteenth century. He said that higher ideals in the matter were sought in this country than in France, where the development had been so active, but where so many people were contented to ride anything at all. The possibilities of the field were enormous; the amount of traffic awaiting the automobile was almost beyond computation, for not only would the invention displace existing wheeled vehicles very extensively, but many who do not now own a horse and carriage would demand automobiles. Its utilization in business would be great, outside of pleasure-driving.

Prof. Thomson's characterization of a good automobile was to the effect that its requirements were ease of

hill climbing, abundant power, ease in steering, safety, cleanliness and unobjectionable character as to noise. As to speed, he said that people would be content with fifteen miles an hour. He did not approve of the French habit of high speed. In this country the automobile-scorcher would be stopped by law, as the bicycle-scorcher has been.

The Coming Show

Under the auspices of the National Cycle Exhibition Company a cycle and automobile show will soon be held at Madison Square Garden, which will offer an excellent opportunity for gathering under our roof all the different makes of American motor-carriages. The Garden will be divided into 143 spaces on the main floor and into 81 additional spaces in the first balcony. Makers of parts used in automobile construction will be well represented.

Without in any way detracting from the advantages of a combined automobile and bicycle exhibition, we cannot help remarking that a specific motor-carriage show, without any bicycles or bicycle appliances, would better serve the interests of the horseless carriage—especially if such an exhibition were organized by the Automobile Club of America.

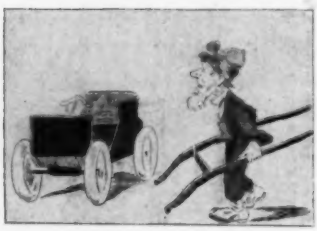
Combined bicycle and automobile shows have attained neither in Paris nor in London the success which has characterized the specific automobile exhibition. The number of automobile makers in the United States is limited, to be sure; but there are enough of them to insure success to an independent show.

Steam-Automobiles

It is our intention to publish in our coming issues two articles on steam-carriages, which should be of considerable interest to our readers. The first article will be written by Prof. Thurston, the Director of Sibley College, at Cornell University, one of our foremost American authorities on steam-engineering. Under the guidance of the author this article will be supplied with illustrations of the best and latest types of steam-motors for the open road, as used in this country as well as in Great Britain and on the Continent.

Our succeeding article on the same subject will be in the nature of a critique by the first French authority on steam-automobiles.

UNCLE SI'S CHRISTMAS PRESENT



1. UNCLE SI: "That's an allfired queer buggy that Rube sent me. Guess he forgot to send the shafts. I'll put some on."

2. "Get ap, Dobbin! I reckon this handle is ter steer with, er maybe it's a brake."

3. "Gee whiz! Whoa, Dobbin!"

4. "Gosh! I'm runnin' over the horse!"

5. "Will this thing ever stop?"

6. "Wall, I'll be gol derned!"

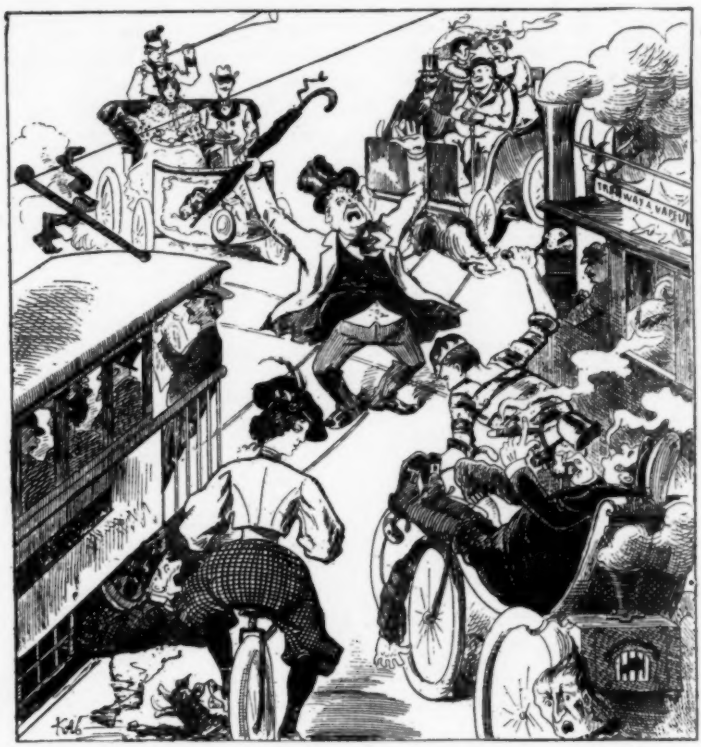
(*From the New York Sunday Journal*)

Automobile Cartoons

AUTOMOBILE TALK

"He has a great faculty for putting the cart before the horse."

"Oh, I wouldn't say that. Say he has a habit of trying to make the wheels run the motor."



The Park Commissioner's Nightmare

(Morland in La Comedie Politique)

Park Commissioner Clausen of New York said that if automobiles were permitted to run free it would soon be impossible for pedestrians to go unmolested. When he consented to enter Central Park in an automobile he was surrounded by an escort of mounted policemen, two riding in front, one on either side of the carriage, and three bringing up the rear.—*Press Despatch.*

Press Notices and Book Reviews

In a recent number of the *Zeitschrift des Vereins für Motor Sport,* Herr Berdow discusses the automobile and its effect upon transportation. After having described the first attempts made in the way of mechanical traction and after having mentioned the great speeds attained of late with motor-carriages, he remarks—perhaps not without justice—that the public cares not so much for high-speed vehicles as for automobiles durable in construction and somewhat cheaper than those now in use. Safety, not speed, is the first requirement to his mind.

In the opinion of Herr Berdow, as well as of many other automobilists, the hydrocarbon-motor carriage, under present conditions, is the only automobile suitable for long-distance traveling. Owing to the great weight of its accumulators and the necessity for frequent charging, the electric carriage has a very limited field. But in large cities the difficulties attending the use of heavy storage batteries are readily overcome, by reason of the many charging-stations met with almost everywhere; here, at least, the electromobile holds its own, if the many cabs and other electric public conveyances be any proof.

Judging from the many horseless delivery wagons which are daily seen on the streets of a large city, it would seem that the automobile is rapidly gaining favor as a means of transporting merchandise. For this purpose no great speeds are necessary, elegance is a minor matter—although some of our delivery wagons compare very favorably in appearance with automobiles used only for pleasure—and the greatest attention is paid chiefly to the construction. Besides being relatively less costly than the pleasure carriage, the automobile transportation wagon is particularly well adapted for connecting out-of-way villages with railways.

Instead of the three or four trains per day placed at the disposal of the public on local lines and small railways, the automobile would enable more trains to be run, owing to the relatively small number of passengers necessary for the success of the enterprise.

Our German contemporary states that in Germany at least seventy-seven passengers must be carried by each train to cover the running expenses of a road; and even if the cost of maintaining the rolling-stock and repair-shops only be reckoned, twenty-one passengers would still be required. An automobile

line could be conducted at the same rates with ten, or with twenty passengers at the most.

Messrs. E. Bernard et Cie have just published the twelfth edition of the *Notes et Formules de l'Ingenieur, du Constructeur-Mécanicien, due Métallurgiste, et de l'Electricien,* compiled by a committee of engineers under the editorship of Charles Vigreux and Charles Milandre.

The new edition has been completely revised, enlarged, and brought up to our present standard of technical knowledge. After the fundamental laws of the various subjects discussed have been tersely and clearly stated, the theoretical formulæ derived from these laws are given, together with the method of applying them practically. In each part of the book, the results which are based upon theoretical calculations are supplemented by those obtained by practical means.

This new edition is concluded with a dictionary in three languages—French, English, and German—in which technical terms most commonly used are translated.

Our French contemporary, *La France Automobile,* has published a most interesting account of the projects of Felix Dubois, the Soudanese explorer. At the *Concours des Poids Lourds* of last year it was proposed to use automobiles in the French Soudan for the transportation of supplies to posts situated between the Senegal and Niger rivers. The project is now about to be carried out. After the very conclusive experiments made by M. Dubois, it has been decided to establish a line of automobiles between Toukoto and Bamakou, separated nearly 200 miles. M. Dubois left France on November with the intention of making all preliminary arrangements. He was accompanied by Captain Ostermann, who has had some experience in similar enterprises, and by two foremen and eight engineers, besides a staff of seven assistants.

The rolling-stock for the line will consist of fifty Dietrich trucks of 9–10 horse-powers, which have been shipped to Saint Louis, together with one million litres (220,000 gallons) of oil. Of these fifty vehicles, five can be transformed into passenger-carriages.

M. Dubois and other members of the Commission arrived at Saint Louis on the 11th of November. The trucks and accessories were transported by boat to Kayes, and thence by rail to

Toukoto. Here the head of the line will be located. Workshops and store-houses will be erected, so that repairs can be made without any delay. M. Dubois will take ten of his trucks to Bamakou, establishing oil-stations along the route as he proceeds.

When the line is in complete operation, convoys of automobiles will transport necessary supplies to the posts, as well as the goods of French traders. Coming back the trucks will be laden with native products, such as rubber, cotton, ivory, gum, and the like.

The most remarkble feature in the whole project is the selection of Chinamen as *chauffeurs*. It seems that besides their carelessness, which would in itself be sufficient to render them incapable of acting as automobilists, negroes have an uncontrollable passion for drinking the petroleum used in the carbureters. Assuredly a more extraordinary vice has not been heard of. The automobile will therefore serve as the direct means of an invasion of the dark continent by the yellow race.

The second edition of the *Manuel pratique du conducteur d'automobiles,* by Messrs. Pierre and Yves Guédore, has just been published.

This new edition contains descriptions of all recently introduced automobiles, and is therefore to be considered as supplementary to the first edition. The work is to be recommended to all those interested in automobiles.

"Le Littoral Sportif" is an illustrated sporting guide of the Marseilles, Toulon, Cannes, Nice, and San Remo districts. It is published by "La Côte d'Azus Sportive," in Cannes, France.

AN IDEAL AMBULANCE

An automobile ambulance has been made for St. Vincent's Hospital, New York City. It is propelled by electricity, and is intended for a model of its kind. Electric power, it is claimed, is more advantageous for propelling a vehicle where it is essential to have a very steady motion. The large pneumatic tires, it is expected, will also contribute in no small degree to the comfort of the patients.

The Automobile Index

Everything of permanent value published in the technical press of the world devoted to any branch of automobile industry will be found indexed in this department. Whenever it is possible a descriptive summary indicating the character and purpose of the leading articles of current automobile literature will be given, with the titles and dates of the publications.

Acetylene Automobiles—

Description of two acetylene gas-motor vehicles, a victoria and a truck; with two illustrations. "Scientific American," New York, November 11, 1899.

Illustrated description of a new carriage built by the Auto-Acetylene Co. "Electricity," New York, November 15, 1899.

Accumulators—

A serial article on accumulators for automobiles, by E. C. Rimington. One illustration. "The Automotor Journal," London, October 16, 1899.

Aluminum—

An article on the possibilities and uses of aluminum as applied to carriage building, by Mr. Percy W. Northey. "The Automotor Journal," London, October 16, 1899.

"Amongst American Motor Men"—

A serial article on the automobile situation in the United States, by Mr. Henry Sturmey. "The Autocar," London, November 4, 1899.

Automobile Hansom—

A New Type of French Automobile Hansom. Illustrates and describes a vehicle exhibited at the recent Exposition in Paris, which is arranged to carry four people and is mounted from the front. "Electrical World and Engineer," September 16, 1899.

Automobile Regulations—

Synopsis of automobile regulations in Belgium. "Electrical World and Engineer," New York, October 28, 1899.

Balancing of Motors—

A serial article on the balancing of motors, by Mr. H. E. Wimperis. With two illustrations. "The Automotor Journal," London, October 16, 1899.

Clubs—

The Automobile Club of France. Francis P. Mann. Gives the history of the club and the work carried out. "Electrical Review," New York, September 13, 1899.

Electric Automobiles—

Description of Belknap Company's light automobile. "The Motor Age," Chicago, October 24, 1899.

Description of an electric Stanhope built by the Kensington Bicycle Co. Illustrated. "The Cycle and Auto. Trade Journal," Philadelphia, November 1, 1899.

Description of the new type of electric cab now in use in Berlin. Two illustrations. "The Motor-Car Journal," London, November 3, 1899.

Illustrated description of an electric automobile vehicle designed by Mr. W. H. Chapman. "Electrical World and Engineer," New York, November 11, 1899.

Electric Motors—

A short description of automobile electric motors built by the Siemens & Halske Co. "Electrical World and Engineer," New York, November 4, 1899.

Hydro-carbon Automobiles—

Description of Raouval's carriage, with 12 illustrations. "La Locomotion Automobile," October 5, 1899.

Description of Underberg voiturette, with two illustrations. "The Motor-Car Journal," London, October 13, 1899.

Illustrated description of the Hugot voiturette. "Motor-Car Journal," London, October 27, 1899.

New hydro-carbon carriage of Hereford, England. Described and illustrated. "The Autocar," London, November 4, 1899.

Hydro-carbon Motor—

Illustrated description of the "Abeille" motor. "La France Automobile," Paris, October 22, 1899.

Loutzky's hydro-carbon motors, 2, 3½ and 5 H. P. With nine illustrations. "Le Chauffeur," Paris, October 25, 1899.

Illustrated description of the Crest gasoline motor. "The Motor Vehicle Review," Cleveland, October 31, 1899.

Igniters—

Description of the "Spiral Igniter," with two illustrations. "La France Automobile," Paris, October 22, 1899.

International Automobile Exposition in Berlin—

Report of the Consul General of the United States, with five illustrations. "Consular Reports."

Liquid Fuel Burner—

Description of the Musker Automatic Liquid Fuel Burner. Four illustrations. "The Automotor," London, October, 1899.

Motocycles—

Illustrated description of Eadie quadricycle. "The Motor-Car Journal," London, October 20, 1899.

Motocycles and How to Manage Them—

A serial article by A. J. Wilson, concerning use of motocycles. Three illustrations. "The Auto-Car," London, November 4, 1899.

Motor Vehicles in the Stock Market—

A long editorial putting special emphasis on the over-capitalization of motor-vehicle concerns. "Engineering News," New York, November 2, 1899.

Motor Wheel—

Description of the Walters wheel for gasoline motors. Two illustrations. "The Motor Age," Chicago, October 31, 1899.

Oil Motor—

Illustrated description of McLachlan heavy oil motor. "The Motor-Car Journal," London, October 13, 1899.

Postal Automobile—

The Loutzky automobile for postal service, described and illustrated. "Le Chauffeur," Paris, October 25, 1899.

Racing Vehicles—

Description of the new Vallée racing carriage, with five illustrations. "The Autocar," London, October 28, 1899.

Illustrated description of the Winton racing vehicle, "Scientific American," New York, October 28, 1899.

Illustrated description of the Benz racing carriage. "The Motor-Car Journal," London, November 3, 1899.

Steam Automobile—

Description of Simpson & Bodman steam lurry, with fifteen illustrations. "The Automotor Journal," London, October 16, 1899.

Steam Generator—

Description of Toward's water-tube steam generator for steam motor vehicles, with four illustrations. "The Automotor Journal," London, October 16, 1899.

Steering Gear—

Description and illustration of the Iden steering gear for automobiles. "The Motor-Car Journal," London, October 27, 1899.

Trials—

Commission's Report on the Test of Heavy Motor Vehicles, Held at Versailles, in October, 1898. Gives the conclusions of the tests made. "Engineering News," September 7, 1899.

French Trials of Electric Delivery Wagons. Illustrates the two electric wagons that stood the Versailles test. "Electrical World and Engineer," Sept. 23, 1899.